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PEARLS AND PEARL FISHERIES.[1]

BY W. H. DALL.

PART I.

THE beautiful objects which form the subject of this discourse are familiar to all, and though neither gems nor jewels they are generally associated with them in our minds and put to similar uses in fact. No gem in its natural condition will compare for a moment in beauty with the perfect pearl, as nature offers it; any touch except that necessary to fasten it in its setting would be desecration. On the other hand true gems, except the opal which comes nearest to the pearl, in general owe their attractiveness far more to the manner in which they are cut and polished than to their inherent properties.

Pearls are produced by shell fish, or, more precisely, by certain mollusks inhabiting the water, the inner layer of whose shells possesses the same iridescent or nacreous character, and is often known as "mother-of-pearl."

The soft internal part of these creatures is covered by a thin delicate membrane called the mantle, by the surface and especially the outer edge of which the shell is secreted. The shell consists of two parts, the epidermis and the shelly matter proper; the latter, again, is usually composed of more or less different layers. The epidermis or skin is of a horny texture and chiefly composed of a substance called conchioline. It is usually colored darker or lighter brown, and may be extremely thin or almost invisible. It may be entirely dissolved in caustic alkali, but is not affected

[1] A lecture delivered at the National Museum, Washington, at the request of the committee of the Biological and Anthropological Societies.

by ordinary acids, and serves as a protection to the carbonate of lime of which the true shell is composed. This carbonate of lime may be deposited in prisms, as of arragonite, in amorphous or fibrous layers, or as "mother-of-pearl." In all cases it contains more or less animal matter which binds it more firmly together. In the case of the pearly or iridescent shell, which is all that it is necessary for us to consider at present, the pearly luster is caused by the action upon light of the minute layers of which the nacre is composed. These layers are microscopically corrugated, and their edges meet the rays of light and partly decompose them, as do the drops in a rainbow, producing the play of varied colors. This has been proved in two ways, first, by digesting mother-of-pearl in acid until all the lime is dissolved. A pellucid membrane, representing the animal matter, still remains, and if undisturbed still shows the iridescence. But if pressed flat so as to remove the corrugations, it also loses its pearliness. Again by means of a diamond splinter, and an engine invented by Mr. Barton of the British mint, similar corrugations have been engraved on the polished surface of a steel button with the result of producing the pearly play of colors; a process which would have proved commercially valuable could the engraved buttons have been kept from tarnishing.

There are also fine superficial lines on pearly surfaces which may add to the effect. These run in various directions, are $\frac{1}{7700}$ of an inch apart, according to Dr. Carpenter, and may be due to the minute cilia with which the mantle is provided.

Pearls are concretions in the tissues, of the same material as that which composes the shell layers, and are usually due to the presence, in the secreting tissue, of some irritating particle or parasite, much as in the tissues of an animal a Trichina becomes covered with a limy cyst. In the mollusk, however, the layers are constantly added to until the pearl reaches a considerable size. When it becomes so large that the valves of the shell cannot close, the mollusk soon dies and the pearl may be washed away and lost. If the pearl escapes from the tissues during the life of the animal, it may become cemented to the inside of the shell; or pseudo-pearls may be formed by the mantle over projections from the inside of the valves. Concretions similar to pearls, but lusterless, are formed in many mollusks, as is frequently observed in the common oyster on our tables.

For technical purposes pearl-producing mollusks are divisible into two classes, fresh-water and marine. It is noticeable that of all the great multitude of air-breathing snails which live upon land, or in trees, not one produces a nacreous shell; and, further, that even among fresh-water mollusks none of the air breathers are pearly, and few of those which breathe by gills, except part of the bivalves, especially those belonging to the group typified by our common river mussels, and so appropriately called the Naiades. We will first consider these, of which the most important is the true European pearl mussel (*Margaritana margaritifera* L.).

This mollusk is found in cool temperate climates over most parts of the northern hemisphere, though not plenty in America and somewhat irregularly distributed. It requires clear streams or ponds, of which the water contains a certain proportion of lime. These conditions are fulfilled in several parts of Britain, North Wales, Sweden, France and Germany, Russia and Siberia. The use and value of these pearls were known to the ancient Romans at a very early period. One reason for the invasion of Britain is said to have been the reputed pearl fisheries. Pliny remarks that it was in his time a well-known fact that "in Britannia pearls are found, though small and of poor color; for Julius Cæsar wished it to be distinctly understood that the breastplate which he presented to Venus Genetrix in her temple, was made of British pearls." Tacitus mentions them as indigenous products of Britain in his life of Agricola, describing them as paler and less brilliant than oriental (marine) pearls. The search for pearls, a profitable industry in which the ancient Britons eagerly engaged, is still carried on to some extent in Wales. The traveler who sojourns in the vicinity of Conway castle is sure to be solicited to buy some British pearls, which in 1857 were worth from one to three dollars an ounce, but are chiefly valuable as curiosities.[1] About one mussel in a thousand contains a pearl large enough to be of any value, so that it is evidently not a very remunerative pursuit.

The British pearl fishery is fully described by Forbes and Hanley in their British Mollusca. The Conway and the Irt in England, the Tay and Yythan in Scotland and the rivers of Tyrone and Donegal in Ireland were the site of the principal fisheries.

[1] Encycl. Brit., Ed. VIII, Art. Pearls.

The Scotch fishery continued until the end of the last century. The mollusks are still collected, but only as bait for the Aberdeen codfishery. The peasants used to gather the mussels in the River Tay before harvest time; the pearls were usually found in old and deformed specimens; round ones, perfect in every respect and of the size of a pea, were worth $15 or $20.

In the twelfth century it appears that there was a commerce in Scotch pearls. In 1355 the Parisian jewelers enacted that no worker in gold or silver should set them with oriental pearls except in large ornaments or jewels for churches. In the reign of Charles I, the Scotch pearl trade was of sufficient importance to attract the attention of Parliament. The Scotch fishery seems to have been nearly forgotten, when in 1860 a foreign dealer, Moritz Unger, conceived the idea of making a tour through the districts where the pearl mussel was known to abound. He found many in the hands of people who did not know their value, and purchased all he could find. In consequence, many peasants took up the search at times when they were otherwise unemployed and some were so successful as to make $40 or $50 a week. In 1865 it is estimated that pearls to the value of $60,000 were found. One Scotch pearl was bought by the Queen for $200. Since the fisheries have revived, the value of the pearls has risen, and good ones bring from $25 to $100. One of the pearls, according to Frédé, which ornament the royal crown of Great Britain, was found in the River Conway by a lady-in-waiting to Catherine, wife of Henry VIII.[1] The lady was fishing and accidentally hooked a mussel, or picked one up on the sand, which out of curiosity she opened and discovered a pearl of unusual size. Otherwise its chief merit consisted in being a native production. It is as large as a bean.

American naiads afford few good pearls, the nacre not being sufficiently brilliant in general, but a few very valuable pink pearls have been obtained from a Florida species. One is represented[2] to have been found in New Jersey which sold in Paris for $2000. In any case the labor and expense, at present rates, in this country are so great as to render the business unprofitable.

In Germany the pearl mussel flourishes best in the Bavarian forest between Regensberg and Passau, and the streams which

[1] Frédé, Voyage, etc. 1882.

[2] American Cyclopædia, Art. Pearls.

head in the Fichtelgebirge. The Saxon fisheries are under the control of the Crown, through the ministry of the interior and of finance, and are chiefly located in the basin of the White Elster and its tributaries, upon which are situated twenty-eight mill reservoirs.

The shell of the pearl mussel is composed of three layers; the outer brown or yellow conchioline or epidermis; next a layer of prismatic character, the calcareous prisms being set at right angles to the inner surface of the shell, and lastly the inner layer of pearly or iridescent shell, which in the pearl oyster is called "mother-of-pearl." The two latter layers are composed of carbonate of lime, and at the margin the horny epidermis usually extends in a flap which is turned in over the edge but not attached to the inner surface. The mature shells sometimes reach six inches in length.

If a foreign body, such as one of its own eggs, a grain of sand or a minute cercarian parasite penetrates where it irritates the mantle and cannot be removed, it speedily becomes encysted or covered by a little capsule. This is thickened from time to time by additional deposits, and thus becomes a pearl. Upon the part of the mantle which makes the deposit, the character of the pearl depends. Some of the concretions partake of the nature of the epidermis, are brown and yellow and without luster. Most fresh-water pearls, when sawed in two, exhibit an aggregation of the prismatic shell substance radiating from a central point, which alternates with concentric epidermal layers and is externally covered and adorned by a stratum of true pearl. If the last is thick, clear and iridescent, the pearl is valuable, if not, it is worthless. It is thus evident that the common notion of a pearl, as being pearly throughout, is in most cases incorrect.

Disease may set up an irritation which will cause shelly concretions to form in the tissues of the mollusk. These are usually small and irregular in shape, and in the pearl mussel are most frequent in the substance of the large muscles which close the valves. Such concretions are called sand-pearls, and are mostly used in embroidery and cheap jewelry.

In the above-mentioned cases the pearl lies in the substance of the mantle or tissues, but it may happen that with increasing size it works out into the cavity of the shell outside of the mantle. In this case it is very apt to become attached to the inside of the

shell, and having become so at one point, the size of the connection rapidly increases, so that the pearl is soon permanently cemented to the spot. These are less valuable because less regular in shape and iridescence than the free pearls. In any case the matter of which the pearl is composed is secreted at the expense of the shell, so that it is not strange that a shell which contains good sized pearls is almost always recognizable, and that it is seldom that a mussel of perfectly normal and regular shape contains a pearl. The fishers claim that three characteristics of the outside of the shell indicate the presence of pearls, namely: 1. Grooves or ridges from the beaks to the margin; 2. A kidney-shaped outline; 3. The asymmetry of the valves with regard to the median vertical plane of the animal.

The regulation of the pearl fisheries in Saxony is very ancient. In 1621 Duke Johan Georg I, of Saxony, reserved this fishery for the Crown, and appointed Moritz Schmirler conservator. From that time to the present day (with a single exception during the seventeenth century) the masters of the royal pearl fisheries, twenty-one in all, have been direct descendants of Abraham Schmirler, who succeeded his brother Moritz in 1643. The family has changed their name in that time by one letter, and call themselves Schmerler. The present incumbent is Moritz Schmerler, Senior.[1]

These fisheries were carefully inspected from a very early period, and general directions for their protection were drawn up by Dr. Thienemann and authorized June 15, 1827. The waters are inspected in spring to see if the mussel beds have been disturbed by ice or débris during the freshets. The area over which the fisheries extend is not searched every year, but is divided into 313 tracts, of which each tract is considered as equal to one day's work for three pearl-seekers; and only twenty or thirty tracts are fished over in any one year, so that after fishing each tract has ten or fifteen years rest before it is fished over again.

The pearl seekers, who appear to be quite at home in the water, gather the mussels with a peculiarly formed piece of iron, which is sharpened at one end. With this they pry open the valves and

[1] For a full account of these fisheries see Dr. J. G. Jahn's "Perlfischerie im Voigtlande," Oelnitz, 1854; and T. v. Hessling's "Perlmuscheln und ihre Perlen" for those of Bavaria. The data here presented in regard to the German pearl fisheries are due entirely to the report of Dr. H. Nitsche on the fresh-water pearl fishery as illustrated by the International Fishery Exhibition at Berlin in 1880.

search the animal for pearls. If any are detected they cut the muscles which hold the two valves together, and extract the pearls; but if none are found the creature is restored uninjured to the water. The pearls are put into a bottle of water on the spot, and afterward dried and sorted in the house. Sometimes a mussel will be found with small pearls in it which give promise of better growth. Such shells are marked with the point of the iron and put back. Sometimes excellent pearls have been obtained from mussels which had been so treated. The pearl fishers recognize four qualities of pearls: clear, half clear, sand-pearls and refuse. The last are chiefly those which are composed only of the prismatic or epidermal shell-substance, are brown or black and without luster. Rosy and green pearls with fine luster are very highly esteemed.

The yearly product of pearls is known from the royal account books.

In 1649 Abraham Schmirler obtained fifty-one large and forty-two small clear pearls, thirty-two half clear pearls, fifty-nine refuse and forty-two black pearls. But only since 1719 has a complete report been made accessible. The results are shown in the following table:

For the Years	Clear Pearls.		Half clear.		Sand-Pearls.		Refuse.		Totals.	
	Total.	Annual.	Total.	Annual.	Total.	Annual.	Total.	Annual.	Total.	Annual.
1719–39	1809	90.45	726	36.35	1200	60.00	552	27.60	4288	214.40
1740–59	1412	70.60	578	28.65	485	24.25	281	14.05	2751	137.55
1760–79	1042	52.10	272	13.60	427	21.35	219	10.95	1960	98.00
1780–99	1261	63.05	243	12.15	357	17.85	179	8.95	2040	102.00
1800–19	1603	80.15	261	13.05	325	16.25	203	10.15	2392	109.60
1820–39	1659	82.95	340	17.00	325	16.25	326	16.30	2650	132.50
1840–59	1884	94.20	610	30.50	388	19 40	305	25.25	3387	169.35
1860–79	1618	80.90	682	34.10	450	22.50	514	25.70	3264	163.20
In 161 years..	12288	76.32	3708	23.03	3957	24.57	2779	17.25	22732	141.19

The table shows the total product for each quality for the periods of twenty years each, and the mean annual product of each quality, also the totals and annual means for the whole period of 161 years covered by the table.

The pearls were formerly turned over to the Royal Museum of Natural History, where they were held subject to the needs of the directors of the famous Royal Art Museum of Dresden. They were sorted and the finest employed in making articles of ornament, collars, bands, etc., and in embroidery. A magnificent pearl collar is one of the treasures of the Dresden "Green vaults,"

it contains 177 pearls from the Elster, and is valued at about $7000. The finest pearls found since 1819 were nine in number, weighing thirty-five karats, and valued at eighty-five thalers each. In 1802 the Royal Museum sold 7000 thalers' worth of pearls, and with the proceeds bought the Racknitz collection of minerals. In 1826 forty-three particularly fine pearls were made into an ornament for the Grand Duchess of Tuscany. The value of the pearls obtained in 1879 was about $750. At present the pearls come under the control of the ministry of finance.

Attempts have been made from very early times to induce artificially the formation of pearls by the fresh-water pearl mussel. To an invention of this kind the celebrated Linnæus, "father of natural history," owed his order of knighthood, conferred by the King of Sweden in 1757. The plan, though successful in producing pearls, was soon given up on account of the expense involved. Attempts have been made more lately in Saxony to obtain pearls in two ways: 1st. By introducing some foreign substance (such as a small pearl or a little pellet of porcelain) into the mantle in imitation of the process by which the finest natural pearls are developed; 2d. By inserting these bodies between the mantle and the shell, as the Buddhist monks of China do with their little tin Buddhas. The first process has not proved satisfactory; in the second the substances used are generally covered with a coating of nacre which may become quite thick but is generally so irregular, and even angular, in shape as to make the result of little value. In 1850 Herr Schmerler began the manufacture of nick-nacks, such as portmonnaies and little boxes of the polished valves of the mussels. These no doubt most of you have seen. They appear at Niagara, at Coney Island, in the Yosemite and at Saratoga, wherever the traveler sojourns and mementos are likely to be in demand. The manufacture has been authorized by the Saxon government and already greatly exceeds in value and importance the pearl fishery of which it was originally a mere incident. The latest improvement reported is that of polishing the shell until it is so thin that it becomes transparent and a photograph can be seen through it, or the purchaser may have his own portrait photographed upon the reverse side of the shell itself, and present it

"Smiling through gates of pearl"

to the lady of his choice.

This industry is carried on in the town of Adorf, where many hundreds of thousands of mussels are worked up annually. If it were not for raw material received from other parts of Europe the Saxon beds would soon be depopulated. A similar manufacture has sprung up in parts of Bohemia and Bavaria. Naturally other sorts of pearl shell are worked up in the same shops, especially *Haliotis iris* Chemn., from New Zealand, and *Turbo marmoratus* L., from the East Indies; *Turbo pica* L., from the West Indies and the Californian "abalones," *Haliotis cracherodii, splendens* and *rufescens.*

Japan produces some small but brilliant pearls from her fresh-water mussels, *Cristaria spatiosa* and *Anodonta japonica,* especially the former.

In China the immense but thin-shelled *Dipsas plicatus* is made use of to produce miracles by the monks of a Buddhist monastery at Pú sa ch'i p'ang. Small stamped tinfoil images of Buddha are slipped between the mantle and the shell at the front end of the animal, and it is then placed in an aquarium or tank. In two or three months they are covered by a coating of pearl which fastens them to the inside of the shell while the embossed features of the image stand out in relief. As many as twenty of these "miraculous" Buddhas are sometimes found on a single valve. The pious pilgrims, in ignorance of the means by which they are produced, consider this the highest testimony to the supernatural character and powers of the venerated founder of their sect, while the monastery reaps a handsome income from the same.

(To be continued.)

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ABORIGINAL QUARRIES—SOAPSTONE BOWLS AND THE TOOLS USED IN THEIR MANUFACTURE.

BY J. D. McGUIRE.

OF recent years soapstone quarries showing undoubted evidences of having been regularly worked by early American races, have been discovered in several of the States of the Union, and it is highly probable that they will be found wherever the soapstone itself is met with of a character suitable for being worked. The manner of working the quarries, the tools used in them, as well as the vessels there made are as yet comparative

novelties to our archæologists, and consequently but imperfectly understood. The specimens found in the quarries, as a rule, are bowls or dishes, although it is known that other articles were manufactured from this stone.

Quarries of soapstone, showing evidence of extensive working, and similar to those we find on the Atlantic seaboard, have been observed in California, and are described in the seventh volume of Wheeler's Survey by Paul Schumacher; although the California Indians made vessels of a different character to those with which we are familiar. It is suggested by Schumacher that the markings of metal tools were observed in the California specimens, though he does not mention the finding of any metal in the quarries. The same suggestion has been made in regard to those articles which we have in Maryland, because of the regular tool marks often observable on the bowls; so far, however, as the remark refers to our bowls, I believe it to be erroneous; primarily because I have seen no indications of the use of metal, not having found a trace of it in my researches, but principally because I have implements of stone, found in the quarries, with which the whole work was capable of being performed. These implements are all of stone, and I feel satisfied that the quarries themselves belong to the pure stone age; Kalm, the Swede, who visited this country early in the last century, describes pot-stone dishes as being made by Indians "notwithstanding their unacquaintance with metals." Although we have no present data by which to demonstrate the antiquity of our quarries, I think we have sufficient evidence to justify our belief that they certainly date to a time prior to the advent of the whites, still they must have been worked up to and within the historic period. According to the opinion of those who composed the expedition of which Schumacher was the chief, the California Indians do not appear to have possessed the art of manufacturing vessels of clay; or if they did, it was to a very limited extent. In Maryland, on the contrary, there is abundant evidence that pottery and soapstone were used at the same time and by the same people, for broken soapstone dishes, or bowls, have been found on village sites, and also in the shell heaps associated with pottery.

The area and development of these quarries seem so extensive, the regularity observed in the shape of the tools in the different quarries, and also in the shape of the dishes, seems so

uniform that one is almost persuaded that these quarrymen, if I may so term them, were skilled artisans.

The Indians of California are said to have traded *ollas* for those things which they stood most in need of, and is it not natural to suppose that the Indian of the East was less a trader than his western cotemporary?

Whilst the dishes do not appear to be difficult to manufacture, so far as mere labor is concerned, there is a certain sameness observable in the tool marks, both inside and outside the bowls, that would hardly be met with were they made by untaught workmen. The same may be said of the tools themselves, most of which I have found to be regularly grooved and peculiarly adapted to the work required of them.

Quarries showing undoubted indications of aboriginal occupation have been several times described; their extent, the character of stone worked, the shape of the dishes, &c., so that I shall confine my remarks as much as possible to that which has struck me as being of interest and novel in those remains.

It has been but a few years since the first of these quarries became known, and their examination thus far has been confined almost entirely to what could be found upon the surface, such as bowls, dishes or other large objects; and but little time has been devoted to anything like a systematic examination, which, if made, could hardly fail of interesting and valuable results.

Frank Cushing, under auspices of the Smithsonian, opened one quarry at Chula, in Virginia, and others are known to exist in Connecticut, Massachusetts, Pennsylvania, Rhode Island, New Jersey, Maryland, District of Columbia, Virginia and North Carolina, and all have, I believe, been discovered within the past decade. Those thus far examined seem to have been devoted solely to the manufacture of articles intended for culinary purposes. Whereas the *olla* of California, whatever its real use, seems best adapted for holding liquids for the purpose of being transported a distance, or for storage purposes, thus taking the place of pottery. Whilst the *olla* of California is better finished than our dishes, which, as is well known, are rude when found in quarries, they all appear to have been taken from graves. Articles of soapstone found in the East, on the contrary, are almost exclusively surface finds in abandoned quarries, and so far as I am aware no finished dishes have ever been discovered. It is to

be hoped that finished specimens will be discovered, for we know they were made, and it is singular they have not been found. Soapstone bowls are heavy, rough, take up much space, and because of their great weight are often left behind by field parties. I have found four or five small pieces of soapstone vessels several miles from any known working place, or vein of the stone, and invariably these small pieces show tool marks finer than any that we have as yet discovered in the quarries; some eveh are smoothed; and pieces have been found with rough attempts at ornamentation. Judging from the number of working places or quarries, and the numbers of broken vessels occurring in them, soapstone must have been extensively used; this use, however, must have been confined within comparatively contracted limits, because of the great weight of the material, unless when near water transportation.

In Maryland, so far as I have observed, the process of making soapstone vessels in quarries, the "pot-forms" seem to have been first taken from the living rock, in a block of a suitable size for the desired vessel. This form or block was obtained by picking a groove on the bed rock and deepening this groove to the desired depth, when it was wedged loose after being cut under as far as possible. The outer lines of the intended dish were then cut on the form which was as yet as solid as it was when detached from the quarry rock, and this cutting was done with a bladed implement. These outside strokes of the tool are almost as bold as if they had been given with an implement of metal, often a chip three inches or more in length being taken from the bowl at a stroke. Almost all the bowls show this cutting process to have been followed and not the pecking or picking so often described as the manner of forming the bowl on bed rock. The handles to these dishes as a rule do not show the same bold stroke we generally find on the body of the bowl, and this I imagine to be because the handles would probably be injured by any such severe usage, they were cut more delicately, aud generally show finer tool marks.

After the outer shape was thus given the bowl, the inner side of the vessel was commenced, and here we find picking again to have been resorted to as when the outer form was first started on bed rock; first a groove just inside the rim of the intended vessel was formed by pecking with a sharp-pointed tool, and the

core thus left must have been detached with a cutting tool, probably used as an adze. After the inner side was thus formed, I am inclined to think a tool somewhat on the order of a chisel was employed, for we find many of the vessels with smooth cut inner sides which I suppose to be secondary cuttings. I have found celts in different quarries with ground edges only, which I am satisfied were used in the quarry preparation of the vessels.

The tools used in quarrying and fashioning these dishes appear to me to be a class of implements entirely distinct from anything which we have heretofore seen or had described. Those sharply pointed and rounded quartz stones with sharp points and cutting edges found in most quarries, were possibly used as suggested by others, in the hands; but to my mind they are natural forms not generally used. Whereas the true quarry tools were mostly if not always hafted and grooved, roughly it is true, but distinctly. Their general shapes I might say are often almost identical with implements from the drift.

One thing very noticeable is the exceedingly rough and rude finish of the dishes found in the quarries, whereas their outlines as a rule are really symmetrical. Any one would, I think, be impressed with the want of finish in a collection of quarry specimens, but more especially is this the case when compared with those small pieces elsewhere alluded to, which we find in the fields. The former are exceedingly rough and thick, and the latter often smooth, always thin and delicate, and sometimes showing a rude ornamentation in the lines found cut on them.

To claim that these quarry specimens were used in anything like their present condition, supposing they were whole dishes, is unreasonable, because of our inability to imagine purposes for which they would have been serviceable. We find in the quarries, almost invariably, broken vessels which must be the failures of a manufactory. It will be asked, of course, where are the completed vessels? Whether cached or buried remains for the future to disclose. We know enough, however, to be able to say positively, the completed vessel does exist; but even then we know as yet but little of it in any condition. The worked surface of the rock in that quarry with which I am most familiar, varies from three to six feet beneath the present surface of the surrounding soil, and the quarry pits are indicated only by slight depressions in the ground, now hardly observable. This filling in of the pits

is of course caused by freezing and thawing of possibly centuries. On opening one of the pits the artificial character of the soil becomes manifest, consisting as it does of chips of the soapstone without number, from the size of a pea to that of one's fist, or even greater, mixed with the soil; with here and there a handle, a rim, or the bottom of a dish, and not unfrequently lost or broken tools. Rude evidences of a forgotten race, of whom all we know, or possibly can know, must be gleaned from these abandoned workshops.

The shape of these vessels varies greatly, though generally speaking they are oblong; some, though, are round and some almost rectangular. They are from an inch to seven or eight deep, and from three to fifteen or eighteen inches long. Whilst some of these were small drinking cups that would have held a gill or so, or were possibly children's toys, others were sufficiently large to hold a gallon or more. Almost invariably these dishes are supplied at the ends with handles coming straight out an inch or two from the body of the bowl. The only explanation of the absence of finished specimens in the quarries that appears to me at all plausible, is, that in the quarries the bowl was only blocked out in the rough, and was left to be completed at the owner's leisure in his home, where ornamentation and finish could be given according to the skill or taste of the individual possessor. The outline being once formed, and the superfluous weight removed in the quarry, the vessel could be carried with comparative ease, though some of the specimens are extremely heavy even then, and some that I have seen must weigh as much as fifty or more pounds, and could not have been transported any great distance from where they were manufactured, except with a greater exertion of strength than was probably ever made. To finish a dish as they were certainly sometimes finished—with delicate sides, smooth polish and rude ornamentation on the outer side—hardly required the same skill as was necessary in giving the bowl its original shape. It is highly probable that the quarry people used finished specimens in or near the quarries, and I trust that when further research is given the subject some of them may be found; but it is of course possible that these quarries were only visited by those who were in search of vessels intended for their own use, and they being fashioned to suit the taste of the individual, were again abandoned; but this suggestion I do not think probable,

although I believe it is related that such was the custom of those who manufactured the Catlinite pipes.

I have found two quarries in Maryland in which the manufacture of soapstone articles seems to have been regularly and systematically conducted, one in Howard and the other in Baltimore county. In many other places in these counties, and also in Carrol, where soapstone crops out, I have found rude vessels which possibly may have come from workings that have escaped my search. On the property in Howard, where one of these quarries is situated, I found, at my first visit, the whole surface of a large tract of woodland, possibly ten acres in extent, almost covered with broken dishes and bowls, with a few implements lying scattered here and there. The rock here crops out in certain places, but a dozen or more circular or elliptical depressions show where either a detached cobble had been worked out or a pit had been sunk to bed rock. For in this place I think both cobbles and bed rock have been worked for the purpose of manufacturing soapstone vessels. In the Baltimore county quarry only the solid beds of stone have been worked; this quarry has produced the best specimens of dishes which I have seen, and is now being worked for commercial purposes. In clearing away the surface soil in order to reach merchantable stone, many interesting specimens both of tools and dishes, or bowls, have been found, but I regret to say that many more have again probably been covered up, because of their value not being recognized by those working the quarry. In this place I have found most of the quarry tools which I now possess, and a sufficient number, I think, to give one a tolerably fair idea of the character of implement used in quarrying and manufacturing soapstone bowls. Here there do not appear to have been more than two or three pits worked, and they are not very extensive, although great numbers of pots must have been here made. The quarry tools appear to have been generally composed of black granite, with an occasional one of limestone or clay slate. Whilst quartz is common in the vicinity of soapstone, and its cleavage of a character to lead one to suppose that it would be generally used for making tools, I do not believe such to have been the case, although in all the descriptions I have read of soapstone quarries, quartz is said to have furnished most of the tools discovered, consequently I may be mistaken. Again quartz is exceedingly brittle, and I hardly think would stand the

constant battering requisite to detach a block from the quarry, or to fashion a bowl; while black granite on the other hand is one of the toughest of stones, and will stand a great amount of work without any appreciable wear. I believe many of these granite tools to have been overlooked because of their great resemblance to soapstone, either when lying on the ground or in the débris. The black granite crops out immediately above both of the quarries mentioned, and within a few feet of them. The quarry tools are of various shapes, and have several features I do not remember to have seen described. Some few are delicate, but the majority of them are exceedingly rough in appearance, and are peculiarly adapted to the work they had to perform. The tools, so far as I can describe them, consist of picks, mauls, axes, both single and double bladed, adzes, celts and chisels. The mauls, adzes, axes, and picks were generally grooved, many of them roughly and indistinctly, and were evidently intended to be used with handles. In fact, one of the men working in the present quarry, who had never suspected the use made of these tools, pointing to a roughly ground turtle-backed pick, now in my collection, said that when they dug it out of the bank it had a handle attached to it, which was made of a forked stick that was wrapped around it, and the ends tucked in the crotch of the stick. The names by which I call these tools are meant only as descriptive of those uses to which they appear to have been put, judging from their shape, and not that they were necessarily used as are the tools to which I liken them. There are some few implements, however, that have shapes which appear unique, and can be compared to no implement now used by white people, with which I am acquainted. The mauls appear to have been used in battering hard substances, and are greatly worn on their ends. The axes have blades flaked out symmetrically, and were many of them double ended, as in fact is quite a common occurrence among several of the quarry implements, the cutting edges are quite sharp, and would be capable of performing good work, although they are not ground. The picks were generally sharp-pointed and quite heavy, and were grooved for handles, whereas there were often picks, long and narrow, ungrooved and having a distinct inward curve, intended apparently for pecking, for being used more as an adze, but even they, I imagine, would have performed quicker and more satisfactory work if hafted. The adzes appear to have been

used for cutting towards one, as are adzes with us, and some of them to have been so shaped as to have been peculiarly well adapted for cutting in the living rock for the purpose of detaching a mass of it for particular purposes, or for giving a shape prior to the article being detached.

Evans in his Ancient Stone Implements describes hatchets, or broadaxes, like a certain class of tools found at Cissbury, in England, in certain pits in the chalk, that resemble our soapstone quarry tools in several particulars. Whilst Evans seems inclined, judging from the shapes of these tools, to attribute them to the Neolithic age, it is only; as he says, because of finding associated with them one or two ground celts that they were not considered Palæolithic. Judging from our present quarry experience, these tools, whilst so ancient in shape, appear to be among the most recent of the tools used during the stone age, which almost staggers one's belief in palæolithic forms. It is very often most difficult to describe stone implements, and I have seen but few palæoliths, and therefore may be mistaken, but there is no doubt in my mind that implements identically similar in shape and material with cave or river-drift implements, are to be found on the surface and associated with polished articles of apparent recent date, and nowhere is this more strikingly illustrated than in the immediate vicinity of Washington city. These stones bear the same characteristics which we observe in implements found under circumstances denoting a great age, but are in localities which lead us to consider them as modern.

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ANNELID MESSMATES WITH A CORAL.

BY J. WALTER FEWKES.

THE occurrence of annelid tubes on the under surface of many specimens of the well-known coral, *Mycedium fragile* Dana, from several localities, led me to suspect that the relationship of the worms which inhabit them to the coral, was that of commensals. Similar instances have been described in other genera by those authors who have mentioned the coral galls. A fact which adds to the interest attached to this subject is, that in almost all cases where the annelid is found associated with the coral, it has modified the general shape of the Mycedium to

which it is attached. The young of *M. fragile* is a simple fungia-like[1] coral attached at its base, somewhat cup-shaped, with smooth outer walls. As it grows older new individuals form as buds upon the upper part of the disk in circles about the original and centrally placed polyp.

These buds differ somewhat from the parent, and as in the branching Madrepore, *Madrepora cervicornis*, we have two kinds of individuals, a single large—the original polyp—and several smaller found below it on the sides of the branch; so in the saucer-shaped colonies of Mycedium there are, as is best seen in smaller colonies, an original polyp, found in the center of the disk on its upper side, and smaller, or buds from the same, which are arranged in regular concentric circles about it. The smooth under side of the Mycedium is destitute of coral individuals, and is generally covered with Bryozoa, small mollusks and worms; of the latter one of the most interesting is the tubicolous annelid which is claimed as a messmate of the coral, and is thought of more importance than the rest in the determination of the ultimate form of the growing coral community.

The calcareous tube in which the worm lives is firmly united throughout most of its length to the under side of the coral. Its terminal opening in a Mycedium of regular shape, lies near the rim of the saucer-like disk of the young coral. In the growth of the rim this extremity of the worm tube is imprisoned by the increasing edge of the disk in such a way that it is wholly surrounded by the live coral in the progress of its growth. The growth of the worm tube, however, keeps pace with the advance of the coral about it, and as it rises above the upper surface of the Mycedium the opening into the tube is kept uncovered by this growth, so that the head of the annelid with its crown of branchiæ can always have free communication with the outside water, notwithstanding the tube itself is often wholly enclosed in the calcareous secretions of the polyps. When the growing coral covers the terminal opening of the worm-tube the worm dies, but this rarely occurs, as the closing of the opening is generally prevented by a corresponding growth of the tube. In several specimens examined the extremity of the tube had grown in a direction at right angles to the upper surface of the coral and

[1] The resemblance is closer to the attached young ("Strobila") of Fungia than to the free adult.

projects a full half inch above that plane. The coral, however, has formed "*æquo pede*" along the sides of this projection and has covered it to the very apex. The result is the formation of variations in the regular growth of the coral which may be likened to a coral-gall such as is formed by the crustacean genera, Hapalocarcinus, Cryptochirus and others. The greater part of the worm-tube lies in sight on the under side of the Mycedium, while its terminal opening is almost wholly concealed, being surrounded by the live coral community through which there is, however, a small opening into the tube cavity inhabited by the worm.

It is interesting to notice, however, that the modifications in form of the growing Mycedium always begin on its rim in the vicinity of the tube opening. As the growth of the coral goes on, the portion of the cœnosarc on the edge of the saucer-like disk coalesces around the obstruction caused by the tube in such a manner as eventually to completely surround it. When this has taken place the end of the worm-tube grows upward and seems to rise out of the midst of the growing coral. In all cases, however, the shape of the coral is changed by the obstruction to its otherwise regular growth.

In Porites and several other genera we have a similar commensalism of annelids and corals. Specimens of *P. astræoides* in which these worm-tubes can be well seen, is found in almost every collection of corals. Many specimens have the interior of the coral mass riddled with these worm-cases, whose openings cover the surface of the coral "head." Such a combination of growing coral and annelids, when both are alive, presents one of the most beautiful sights upon a live coral bank.

While younger specimens of Mycedium, almost without exception, have a regular disk-like shape, which in older and larger colonies where the annelid is not found, is still preserved, it almost always happens that the presence of the worm-tube leads to irregularity in form in the animal upon which it is found. Younger specimens are especially well adapted for a study of this phenomenon. Mycedium grows to the level of low water, and is often exposed to the air by very low tides. It is, however, quite hardy, and the short exposures are by no means always fatal. It prefers for its home sheltered lagoons to the open reefs beaten by the surf, which would soon destroy its fragile disk. Its favorite habitat is the side of submarine cliffs and caves.

PROGRESS OF INVERTEBRATE PALÆONTOLOGY IN THE UNITED STATES FOR THE YEAR 1882.

BY CHARLES A. WHITE, M.D.

A FAIR amount of work has been done during the past year. No deaths have occurred among American palæontologists, and one new name appears among those mentioned in the present reviews.

In the *American Journal of Science* for January, pp. 40–46, Mr. Alexander Agassiz discusses the resemblance of living deep-sea Echinids with those of Cretaceous age, under the title, "The connection between the Cretaceous and recent Echinid fauna."

In the June number of the *American Journal of Science*, pp. 476–478, and one plate, Mr. John M. Clarke proposes and illustrates three species and two new genera of Crustaceans, *Spathiocaris* and *Lisgocaris*, under the title "New Phyllopod Crustaceans from the Devonian of Western New York." In the July number, pp. 55 and 56, he describes a Cirriped Crustacean from the Devonian, under the the name of *Plumulites devonicus*.

Dr. J. W. Dawson, in Proceedings of the Boston Society of Natural History, Volume XXI, p. 157, has a "Note on Spirorbis from an iron-stone nodule from Mazon creek, Illinois." Dr. Dawson notes the occurrence of a *Spirorbis* in connection with a fossil Millipede of the coal measures. He regards it as identical with a form found in the coal measures of both Nova Scotia and Europe. This was published in 1881, but it was not noticed in my last year's review.

Professor James Hall has prosecuted his great work for the State of New Jersey during the past year as he has been doing in the past. He also prepared a revised edition of all the publications he had previously made on the celebrated Niagara fossils at Waldron, Indiana, with important additions of text and plates, now thirty-six in all, and published the work in Professor Collett's Annual report (the eleventh) of the Geological Survey of Indiana for 1881. He has now in hand another important work for Professor Collett's next report.

Professor Angelo Heilprin has made the following publications in the Proceedings of the Academy of Natural Sciences of Philadelphia for 1882: "On the discovery of Ammonites in deposits of Tertiary age," pp. 94; "On the relative ages and classification

of the Post-eocene Tertiary deposits of the Atlantic slope," pp. 150–186; "On the occurrence of Nummulitic deposits in Florida, and the association of Nummulites with a fresh-water fauna," pp. 189–193; "On the age of the Tejon rocks of California, and the occurrence of Ammonites in Tertiary deposits," pp. 196-214.

In the first of these papers Professor Heilprin states his positive conviction that the Tejon group of California is Tertiary and not Cretaceous, and in the fourth paper he reaffirms this opinion. In the second paper he takes the ground that no true Pliocene deposits occur on the Atlantic slope of the United States.

In September Mr. U. P. James published No. 6 of his "Palæontologist," pp. 46–53. It contains "Descriptions of ten new species of Monticulipora from the Cincinnati group, Ohio."

The well-known Swiss palæontologist, Professor P. de Loriol has, in the Journal of the Cincinnati Society of Natural History, p. 118, Plate v, a "Description of a new species of Bourgueticrinus," from the Ripley group, Cretaceous, of Alabama.

Mr. S. A. Miller has published a new edition of his useful "Catalogue of American Palæozoic Fossils." He has also published the following papers in Volume v of the Journal of the Cincinnati Society of Natural History: "Description of two new genera and eight new species of fossils from the Hudson River group, with remarks upon others;" "Description of ten new species of fossils;" "Description of three new species and remarks upon others;" "Description of three new orders and four new families in the class Echinodermata, and eight new species, from the Silurian and Devonian formations." These papers are one each in the four numbers of the journal, in the order here mentioned. They are all illustrated on Plates 1, 2, 3, 4, 5 and 9 of that volume.

Professor J. S. Newberry opposes the views of Professor Heilprin that the Tejon group of California is of Tertiary age, in an article in the Proceedings of the Academy of Natural Sciences for 1882, pp. 194, 195, entitled "On supposed Tertiary Ammonites."

Professor A. S. Packard, Jr., in an article in the AMERICAN NATURALIST for April, opposing the views of Professor Lankester that *Limulus* is an Arachnid nearly related to the scorpions, calls attention to the fact that scorpions and limuloid crustaceans existed as early as the Carboniferous age, and were then as widely differentiated from each other as now.

Julius Pohlman, in the Bulletin of the Buffalo Society of Nat-

ural Sciences, Vol. IV, No. 2, pp. 41–45, Plates II and III, publishes "Additional notes on the fauna of the Waterline group near Buffalo." One of the species he estimates had a length of thirty inches when perfect.

In the Journal of the Cincinnati Society of Natural History, Vol. V, pp. 119–121, Plate V, E. N. S. Ringueberg publishes "Description of two new species of Crinoids from the shales of the Niagara group at Lockport, N. Y.

M. C. Schlumberger, of Paris, France, has "Remarks upon a species of Cristellaria," in the Journal of the Cincinnati Society of Natural History, p. 119, with illustrations on Plate V. The Foraminifer is from the Ripley group, Cretaceous, of Alabama, and is referred by this author, with some doubt, to the *C. rotulata* of D'Orbigny.

Mr. Samuel H. Scudder, has done much in fossil Entomology, as the following notes will show:

"Fossil Spiders," Harv. Univ. Bull., 2, 302–303. (Reprinted under title: "Our knowledge of fossil Spiders," in *Field Naturalist*, 1, 61-63, Manchester, Eng.)

"Archipolypoda, a subordinal type of spined Myriapods from the Carboniferous formation." Memoirs Bost. Soc. Nat. Hist., 3, No. 5, p. 143-182, Pl. 10-13, figures also in text. [Criticised by Packard recently in AM. NAT.]

The general matter was printed in *Silliman's Journal* the year before, but this contains in addition the full description and discussion of all the species and genera, twelve species, four genera.

The first part of Mr. Scudder's Nomenclator Zoölogicus appeared (pp. 19 + 376), containing a vast number of palæontological genera. The second part is now half through the letter M, and is to contain about 80,000 references, being an index to Agassiz, Marshall, the *Zoological Record* and Scudder.

"The affinities of Palæocampa Meek and Worthen, as evidence of the wide diversity of type in the earliest known Myriapods," *Amer. Jour. Sci.* (3), 24: 161-170. *Amer. Mag. Nat. Hist.* (5) 10: 286-295.

"A new and unusually perfect Carboniferous cockroach from Mazon creek, Illinois." Proc. Bost. Soc. Nat. Hist., 21: 391-396.

"Notes on some of the Tertiary Neuroptera of Florissant, Col., and Green river, Wyoming Terr." Proc. Bost. Soc. Nat. Hist., 21: 407-409.

"Older fossil insects west of the Mississippi." Proc. Bost. Soc. Nat. Hist., 22: 58-60.

"On additional remains of articulates obtained by Dr. Dawson from Sigillarian stumps in the coal field of Nova Scotia." [Note to a paper of Dr. Dawson's.] Phil. Trans. Roy. Soc. Lond., 1882: 649-650.

Proof of Mr. Scudder's memoir entitled, "The Carboniferous hexapod insects of Great Britain," has been read, and will appear shortly in the Memoirs Boston Soc. Nat. Hist., Vol. 3, with one plate. The general part of it appeared in *Geological Magazine* in 1881, under the title, "Two new British Carboniferous insects, with remarks on those already known." The plate contains, among other things, a *chromo* of one Carboniferous wing to show the colors remarkably preserved.

Mr. E. O. Ulrich began, in the October number of the Journal of the Cincinnati Society of Natural History, an important series of illustrated papers on "American Palæozoic Bryozoa." The second paper appeared in the December number, and is to be continued into the succeeding numbers for 1883. In the October number of that journal, pp. 175–177, he publishes "Description of two new species of Crinoids from the Cincinnati group," and illustrates them on Plate v.

In the February number of the *American Journal of Science*, page 151, Mr. C. D. Walcott gave a "Notice of the discovery of a Pœcilopod in the Utica slate formation." In the March number of the same journal, pp. 213-116, he made further publication of the same discovery with the title, "Description of a new genus of the order Eurypterida from the Utica slate." The name proposed for the new genus is *Echinognathus*.

Bulletin No. 1 of the Illinois State Museum of Natural History at Springfield, Illinois, has been issued, octavo, pp. 43. It contains two articles by A. H. Worthen and one by Charles Wachsmuth, but no illustrations.

Mr. Wachsmuth's paper occupies pp. 40-43, and is entitled, "Descriptions of two new species of Crinoidea from the Chester limestone and coal measures of Illinois."

Mr. Worthen's articles are entitled respectively: "Descriptions of fifty-four new species of Crinoids from the Lower Carboniferous limestones and coal measures of Illinois and Iowa;" and "Addenda-corrections and proposed new names for species pre-

viously described in the Geological Survey of Illinois, under names that were preoccupied; and descriptions of two new species of fossil shells from the coal measures of Illinois and Kansas." All these species described and discussed by Messrs. Worthen and Wachsmuth are to be illustrated in the forthcoming seventh volume of the Illinois Geological Survey.

No. 3, Volume I, of the Bulletin of the American Museum of Natural History of New York, has been published, containing sixty-one pages of text and four plates. It is wholly devoted to an important work by Professor R. P. Whitfield, "On the fauna of the Lower Carboniferous limestones of Spergen Hill, Indiana, with a revision of the descriptions of its fossils hitherto published, and illustrations of the species from the original type series." Professor Whitfield proposes three molluscan genera, namely, *Lepetopsis*, *Bulimorpha* and *Eotrochus*. The greater part of these species were published without illustrations by Professor Hall in 1856, in the Transactions of the Albany Institute, and have become widely known under the designation "Spergen Hill fossils."

In the March number of Annals of the N. Y. Academy of Sciences, pp. 193-244, he published "Descriptions of new species of fossils from Ohio, with remarks on some of the geological formations in which they occur." This is a preliminary publication of matter that is to appear in a forthcoming volume of the Ohio Geological Survey. Forty-seven new species are described and one new Cephalopod genus (*Trematoceras*) proposed. The formations from which the fossils come, are of Devonian and Lower Carboniferous age.

In the Proceedings of the Academy of Natural Sciences of Philadelphia for 1882, pp. 17-34 and Plate I, Professor Henry S. Williams published "New Crinoids from the rocks of the Chemung period of New York." He has also published from the Cornell University press, Ithaca, N. Y., a "Catalogue of the fossils of the Chemung period of North America," pp. 14, 8vo.

During 1882 I have made four palæontological publications, as follows: "Conditions attending the geological descent of some fresh-water gill-bearing Mollusks," *American Journal of Science* for May, pp. 382-386; "New molluscan forms from the Laramie and Green River groups, with discussion of some associated forms heretofore known," Proceedings of the U. S. National Museum, Vol. V, pp. 94-99, Plates III and IV; "Molluscan fauna of the

Truckee group, including a new form [*Latia dallii*], pp. 99-101 Plate v; "Fossils of the Indiana rocks, No. 2," Eleventh annual report of the Indiana Geological Survey, pp. 347-401, Plates 37-55. Four new species are described in this work, but it is mainly a republication of forms more or less well known. Seven new plates were prepared expressly for this work, but the remaining twelve plates are made up of figures which were engraved over twenty-five years ago by John W. Van Cleve to accompany a work on fossil corals, which he did not live to accomplish.

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NOTE ON THE GENUS CAMPELOMA OF RAFINESQUE.

BY R. ELLSWORTH CALL.

THE earliest known forms of this subgenus of the great molluscan family Viviparidæ appears to have been described by Thomas Say as a Limnæa,[1] the type of the group being the form now common in collections under the name of *decisa*. The form on which the description was based is illustrated by Fig. 6, on Plate III, and is reproduced as Fig. 13 by W. G. Binney in his monograph of this family published as Smithsonian Miscellaneous Collections, No. 144. In a subsequent corrected edition of the Encyclopædia the same form and plate appear, bearing however the name of *Paludina decisa* Say. This reference is the first in which any of the forms of this group are referred to Paludina, a subgenus not represented in North America so far as known. In several instances European malacologists appear to have confounded these American forms with different exotic subgenera. They have been referred by these foreign systematizers variously to Ampullaria,[2] Melania,[3] Helix,[4] Cochlea,[5] and Melantho. Mr. W. G. Binney appears to be the first among American authors to employ the name of Melantho for these mollusks, though in this he followed the unpublished work of Dr. William Stimpson.[6] It is

[1] Nicholson's Encyclopædia, ed. 1, 1817, and ed. 2, 1818.

[2] Deshayes. Encyc. Meth., Tome II, p. 32.

[3] Menke. Syn. Meth., p. 134.

[4] Wood. 2d Supplement, p. 226. (Hauley's ed., 1856.)

[5] Lister. Conchyliologie, Tome 127. Quoted on the authority of W. G. Binney. I have no means of personal verification.

[6] *Vide* Preface to Smithsonian Misc. Coll., No. 144, p. iii.

difficult to understand how so accomplished a naturalist came to adopt the subgeneric name of Melantho for shells distinctively American and of fresh-water habitat, when for forty or more years the genus was known to have been founded on a marine fossil from the Paris basin. The genus is defined by its author[1] in the following terms: "Peristome incomplete, not effusive; very thick; white. Subglobular. Marine." It is classed by him as a subgenus of Melania. Following Dr. Stimpson, Mr. Binney has brought Melantho into quite general use among American conchologists; though occasionally one is found still using the exotic subgenus Paludina.

Aside from the grave doubts excited by the history of this genus with reference to its applicability, there comes into the question the important consideration of priority. Mr. Binney in his monograph makes no mention of the prior genus proposed by Rafinesque, whose misfortune it has been to incur the incubus of falsification in matters pertaining to natural science. That naturalist, eccentric as he no doubt was during the latter portion of his career, did actually collect from the Ohio river shells of this group, and did actually describe them. In the *Journal de Physique* for 1819,[2] Rafinesque described his new genus Campeloma, citing characters which I translate as follows: "Shell oval. Aperture oval, truncated at base; lip reflected, united in a point behind. Umbilicus wanting. Animal unknown."[3] For the particular shell before him Rafinesque adopted the specific name of *crassula*, and stated that he had only found it in the Ohio. Moreover he further characterized this species as having "four whorls of the spire reversed,"[4] a quite common feature, as every collector knows, among certain species of this class, though they are nominally dextral. The assumption that the French naturalist had before him a *reversed* specimen of Say's *Paludina ponderosa* is strengthened by his specific name *crassula*, bestowed in allusion to its texture. To this again is to be added the etymology of the generic name, which, taken in connection with specific characters, leave no room for doubt as to the real nature of the specimen on which it was founded. Being a scholar as well

[1] Bowditch. Elem. Conch., p. 27, Plate IV, Fig. 15, 1822.

[2] Tome 88, p. 423.

[3] Test ovale. Ouverture ovale, base tronquee, lèvres reflechies, flexueuses, unies en ponts posterieurement. Point d'ombilic. Animal inconnu.

[4] "4 tours de spires contraires." *Loc cit.*, p. 423.

as naturalist, a dualism unfortunately not always enjoyed by students of nature, he turned to the Greek for a generic name, and found in it the words καμπη, a *bending*, and λωμα, a *margin*, an etymology in exact keeping with the sigmoid character of the aperture of all the species of the genus.

It remains now to note what has been the reception of Campeloma by naturalists. In botanical science and in other sections of zoölogy than that relating to mollusks, his generic and specific names have received little sanction. But among students of the Mollusca one is occasionally found willing to do the "Transylvania professor" justice, when it can be shown all but conclusively that his names are entitled to recognition. For years Campeloma remained unknown, or if known its claims were unheeded. It remained for an American naturalist to first properly apply Rafinesque's diagnosis, and that naturalist was Dr. Theodore Gill. In the Proceedings of the Philadelphia Academy of Natural Sciences for 1864,[1] he cites the main facts in the history of Campeloma; shows that it has precedence of Melantho by three years; and that it could have been based only upon a mollusk referable to Paludina as that genus was then understood by naturalists. This is the first, and it must be admitted a successful attempt to interpret Campeloma and refer it to a well-known mollusk.

Among foreign authors Rafinesque's genus appears to have been as sadly misunderstood as Bowditch's Melantho has been by American systematists. Herrmannsen[2] gives the correct date of the founding of the genus and its proper etymology, but follows Menke in making it a subgenus under Turbo, thus entirely mistaking its scope. But in the same treatise, on page 23 of Supplementa et corrigenda, he refers Campeloma to Melanopsis of Ferussac, with a mark of doubt, thus further removing it from its true position. Chenu[3] following the Messrs. Adams, makes Melantho a subgenus under Paludina with a very poor figure of Say's *ponderosus* serving as the type. Like the illustrious systematists he so implicitly followed, he makes Lamarck's genus Vivipara a synonym of Paludina, and further confuses the matter by giving *Vivipara georgiana* Lea, a place in illustrating Melan-

[1] *Loc. cit.*, p. 152.

[2] Indicis generarum Malacozoörum Primordia, Vol. I, p. 161.

[3] Manuel de Conchyliologie, Tome I, p. 310.

tho. It is quite difficult to conceive of two species more widely separated from each other than the two this author makes illustrative of Melantho. I know of no naturalist in America who would not unhesitatingly refer these shells to separate and distinct genera.

Summing up the facts in the case of this neglected genus, it is certain that the shells constituting it cannot be referred to Paludina of Lamarck, and equally certain it is that Melantho of Bowditch will not apply. There having been as yet no other generic name proposed but Campeloma for these mollusks, one species of which was surely before Rafinesque in framing his diagnosis, the rules of priority, and justice alike, will necessitate its use.

A word or two regarding the forms included in Campeloma may not be out of place. The genus has a wide distribution east of the Rocky mountains, occurring in nearly or quite all the States from Texas to Maine, to Minnesota and beyond into British America. The most widely distributed species of the group is *Campeloma decisum* Say, which is found throughout all the northern sections of this region, extending into Nova Scotia and far northward in the Province of Quebec; thus being the only species the distribution of which reaches beyond the territory of the United States. It is the only form common in New England. In the western portion of this latter area appears another form, the *Campeloma integrum* DeKay, and in the extreme south-west of Connecticut the distinct form *Campeloma rufum* Haldeman, also occurs. The most western limit of this last species appears to be the Cedar river in Iowa, from which locality a single specimen has been placed in my cabinet. The three species mentioned, *decisum*, *integrum* and *rufum* are found associated in great numbers in certain parts of the State of New York, notably in the Erie canal, and wherever so found retain their specific characters to a remarkable degree. Westward from New York, in Western Pennsylvania in the drainage of the Ohio, a fourth form occurs, which appears to reach its greatest development in that great waterway, the *Campeloma ponderosum* Say; a reversed specimen of which form, as has been said, served as the type of the genus. In the State of Ohio occurs a fifth form, the *Campeloma obesum* Lewis, which seems to luxuriate in the quiet waters of the central portions of the State. In Illinois, and per-

haps further eastward, a sixth distinct form predominates, seeming to replace all the others, the *Campeloma subsolidum* Anthony. The form *decisum* also occurs in the northern portions of the same State. From the Mississippi river, at a single station in Mercer county, are collected peculiarly constructed forms which may, until more is known about them, be doubtfully assigned to Anthony's *subsolidum*. They have been described by Dr. Isaac Lea as *Campeloma milesii*, his *type*, however, coming from Brand lake, Michigan. Specimens of the same form have been received from Arkansas. The forms thus far mentioned would appear to comprise all the species found in the Northern United States. Passing to the south of the great drainage system of the Ohio river, including the Tennessee and Cumberland drainage areas, only two forms appear common in some portions of the area we have described, the *Campeloma ponderosum* Say, and *C. rufum* Haldeman. The first of these attains a great size and high degree of perfection in the Warrior, Alabama and Coosa river systems, as well indeed as in the Tennessee river, in that portion of its course which lies in the State of Alabama. The second species, *Campeloma rufum* Hald., is taken in some numbers in the Hiawassee river in Tennessee, where its forms exhibit great beauty and perfection. It should be remarked, however, of the shells from Alabama which have been referred to this species, that grave doubts are entertained of their correct determination; the facts connected with them pointing to a distinct and probably new species. In all the shells which are thus known to be common to the two areas, are presented some very interesting facts bearing on the influence of environment on animal life. Over this last area, and beyond toward Louisiana, occur other forms which, in a critically accurate revision of the genus, it will be necessary to recognize as good and distinct species. They are *Campeloma decampii* W. G. Binney, occurring in the Tennessee drainage of North Alabama and south to the confluence of the Coosa and Tallapoosa rivers. In the Coosa and Cahawa rivers occurs a form described as *Campeloma nolani* Tryon, which it will also be necessary to recognize. In a few of the collections in which it has been placed it bears the name of *ponderosum*, but would seem to be sufficiently distinct. From this same State there has been described, by Dr. Lea, a form known as *Campeloma coarctatum*, said also to occur in South Carolina, Mississippi and Arkansas.

Summing up the facts of geographical distribution, as the species are now understood, we have two entirely distinct groups of these mollusks which, in general terms, may be said to be governed in distribution by geographical features, and two of them—one of the two being doubtful—appearing common to the two areas; *Campeloma decisum* has the northernmost range, and *Campeloma ponderosum* the southernmost. Further collections are yet needed to fix definitely the range of the several species, and to properly define their specific relationship.

It might be added, in concluding this note, that these neglected mollusks promise a rich reward for him who shall study them anatomically. Their life-history is entirely unknown; the limits of the species poorly understood and thus far often misinterpreted; and what is important from a purely zoölogical standpoint, their geographical distribution and the influence of environment need careful elaboration.

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MOSSES.

BY PROFESSOR W. W. BAILEY.

MOSSES have always had a peculiar attraction for certain students, yet there are comparatively few who study them. In ordinary school or even college courses of botany they are barely mentioned. Indeed, the study of Cryptogams, or flowerless plants, is by far too much neglected. Ferns, it is true, have many votaries, scientific and amateur, but one rarely hears of any but a specialist engaged in the examination of mosses, lichens, or fungi. Algæ have been more fortunate, and have always excited more or less popular interest.

It is, undoubtedly, the difficulty attending the study of mosses that has caused them to be so much neglected. One must be rather expert with the microscope to accomplish much in their investigation. This entails expense, but after all not so much but that many persons of fair means might indulge in the pursuit. A good microscope, with its appurtenances, is to-day within the reach of any who care to husband their resources for a while with the object of securing one. I must say, however, in passing, that any purchaser who is himself unfamiliar with the instrument,

should always consult some specialist, otherwise he is likely to commit an egregious error in his investment.

Mosses can be studied throughout the year, hence they afford a most delightful winter occupation. Certain species, varying with the season, can always be found in condition, but of course some regions are much more favored than others. In the White mountains, for instance, mosses literally cushion the rocks, clothe the standing or fallen trees, and spread over the ground. Often they hang from moist cliffs in those billowy curves assumed by snow heaps on a roof. The traveler sinks knee deep in the drifts they form. The number of species is often bewildering. A mat removed, say from some wind-fall, is discovered to be a tangle of many kinds. It would require an expert to separate them. Often they are found, as in the case of the genus Fontinalis, trailing in springs or running streams. They climb, too, high up into the Alpine regions, some kinds being found only on giddy mountain tops.

A few words about the study of these bewitching little plants. One first has to determine whether the fruit is *terminal* or *lateral*, that is, whether borne at the ends of the stems or as an outgrowth from the sides. Mosses are by this means divided into two great sections, the Acrocarpi and the Pleurocarpi. Any Polytrichum would be an example of the first class, and a Hypnum of the second. It is not always an easy matter to determine this point. Having settled it, however, one next examines the *urn*, *capsule* or *theca* (it is known by either of these names), to discover whether or not it is covered by an *operculum*. This is a sort of lid, which may be deciduous or persistent. If it does not fall away the plant is looked for in Section A of the artificial key of Gray's Manual (edition of 1863, now out of print and rare). Otherwise we proceed to Section B. Under this second head we find that the mouth of the capsule may or may not be provided with *teeth*. These if present are always in *fours* or multiples of *four*. Within these teeth there are frequently subordinate processes called *cilia*, and within these again *ciliolæ*. All these must be carefully looked for. It should be said, also, that it is very important to count the external teeth, which may range as high as sixty-four; they form the peristome. Delicate manipulation may be required to estimate them, both in the use of the lenses and illumination, and in the handling of the knives and needles. External to the teeth

lies the ring or *annulus* upon which they are inserted. It varies much in its development. The capsules, it should be mentioned, are, at some period of their growth, clothed with a membranous cover, either entire like a candle extinguisher, when it is *mitriform*, or split on one side and hood-like, when it is *cuculliform*. This body, called the *calyptra*, is apt to be fleeting, and hence easily lost. It is often entirely absent in mature specimens, but is important and should always be secured if possible. The capsules assume all kinds of forms—cylindric, oblong, globose, pyriform, unequal sided, obovoid, etc. The powdery particles they contain are the *spores* or *sporules*. The capsules are borne on thread-like *pedicels*, though sometimes nearly or quite sessile. An enlargement of the pedicel just below the urn is known as *apophysis*. The elongated receptacle of the flower takes the name of the *vaginula*. Often the capsules are immersed or partly hidden in the floral (*perichætial*) leaves, as in Fontinalis. "Intermixed with the reproductive organs are cellular, jointed filaments (*paraphyses*)." Mosses have two kinds of reproductive organs, sometimes separated on different plants (*diœcious*), but oftener found on distinct portions of the same plant (*monœcious*). Some are even *polygamous*. The fruit of quite a number is not known at all. The process of reproduction is quite recondite, and beyond the scope of the present article.

It should be said that the character of the stem and of the leaves is most important. The latter must be closely studied as to their shape, margins and appendages. The mid-rib may be prominent, forming a *costa*, or even prolonged above into an *awn*. The so-called *areolation* or arrangement of the cells of the leaves is quite characteristic, assuming very beautiful geometric forms. In Sphagna, which some authors separate from true mosses, delicate cross sections of the leaves must be examined.

There are many points of terminology and description upon which I have not here entered, indeed, the terms used are extremely numerous, and to a beginner perplexing. One learns to master them and their application only by persistent use. They are usually defined in any good manual of mosses or any general botanical glossary.

At every step of one's work in the study of mosses he is impressed with the extraordinary beauty of the objects revealed. The leaves are wonderful microscopic objects, and the capsules

with their teeth, often hygrometric, are fashioned with the utmost delicacy. Then the whole habit of the various plants is so diverse! Some are prostrate; others growing erect, like Poly-

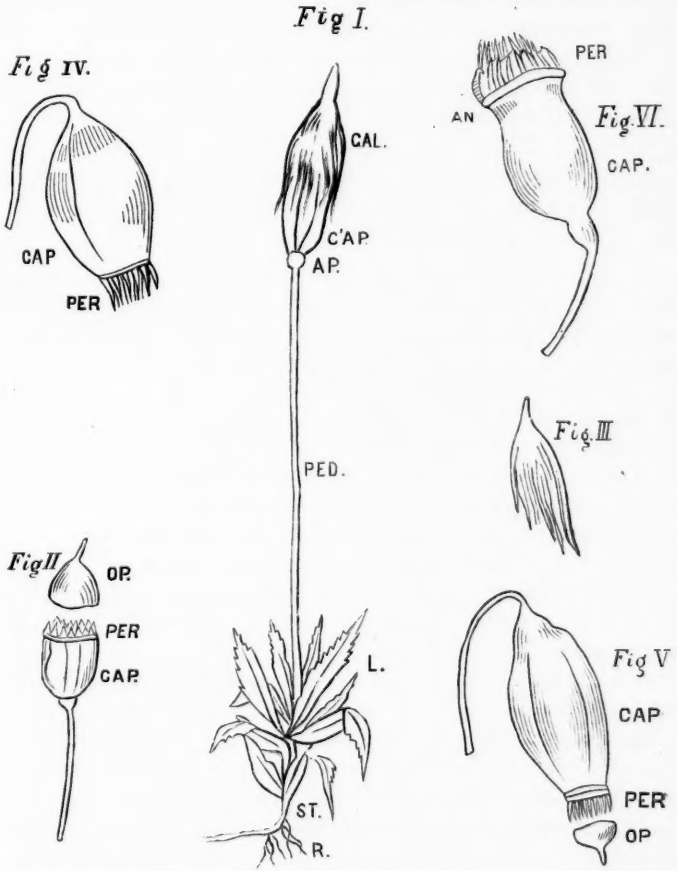

FIG. I.—A Polytrichum. *cal*, calyptra; *cap*, capsule; *ap*, apophysis; *ped*, pedicel; *l*, leaves; *st*, stem; *r*, roots. FIG. II.—The same with calyptra removed. *op*, operculum; *per*, peristome; *cap*, capsule. FIG. III.—Hairy calyptra of same. FIG. IV.—A Mnium. *cap*, capsule; *per*, peristome. FIG. V.—The same. *cap*, capsule; *per*, peristome; *op*, operculum. FIG. VI.—A Hypnum. *per*, peristome; *an*, annulus; *cap*, capsule.

trichum, imitate pine forests; others, like Climacium, resemble miniature palms. In Barbula the teeth are curiously twisted.

The foliage of some is dark-green in color; of others reddish or brownish, and in Leucobryom it is almost white.

Mosses are widely distributed over the earth from the equator to the poles, and inhabit very diverse locations. When dried up by the heats of summer they will soon recover under the influence of moisture, at once resuming their vivid colors and beauty. They are probably among the oldest of the existing families of plants, and their part in life is to prepare the way, by their action on the soil and decomposition, for the higher vegetation. This task they share with lichens, whose history is perhaps even lower. Their direct economic uses are few, but as objects of study they will ever possess an increasing interest.

The collection of mosses is a comparatively simple matter, and may be here briefly stated for the guidance of such as may be inclined to gather them. In the first place, having selected some specimen for preservation, shake out from it as much as possible of the soil, or if the plant is attached to a tree, obtain a thin slice of the bark to which it adheres. Always make notes of the medium from which it is obtained, as earth, tree or rock. If the kind of tree is known, indicate it on the accompanying label. It should be stated, too, if the tree on which it grows is dead or alive, or if the moss is on the ground, the character of the soil. Remember to affix the time and place of collection. The specimens are best preserved in a portfolio of binder's boards, or a book 10 × 15 inches, which can be tied together by tape or strings, and is filled with bibulous paper. The collector should carry with him into the field besides, a number of paper envelopes or pockets for the reception of specimens. Put but one species in each pocket. They require comparatively little pressure. For mounting use a firm white paper six inches in length by four and a quarter (6 × 4¼) in width. The plants can be attached by means of paste, and arranged in books or loose sheets in the herbarium.

Lastly, it may be of interest to state the names of some of the American botanists who have been especially distinguished in this field. Of these the late Wm. S. Sullivant is perhaps the best known. He prepared the paper on mosses for Gray's Manual, besides many elaborate and costly illustrated works. Death has lately removed those other accurate and careful muscologists, Coe F. Austin, of New Jersey, and Thos. P. James, of Cambridge,

Mass. The veteran Professor Tuckerman, of Amherst, still remains, and from him and Professor Lesquereux, of Columbus, Ohio, the well-known palæontologist, we now hope to obtain a work on mosses to supply the place of the old manual and to bring the science up to date.

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EMOTIONAL EXPRESSION.

BY A. T. BRUCE.

TO Darwin, more than to any previous investigator, must be credited precise and comprehensive explanations of emotional expression, owing largely to the prominence given by him to hereditary influences which often afford explanations of emotional phenomena where individual experiences do not appear sufficient. The study of emotional language is interesting both from a physiological and psychological point of view. Considering its psychological bearings it seems proper, before entering on a detailed description of any emotional expression, to present in outline such a definition and classification of emotions as narrow limits admit of.

An emotion may be defined as a tendency to act accompanied or unaccompanied by a particular feeling. In the common acceptation of the term, emotion means a tendency to act accompanied by a feeling which is the distinctive mark of the emotion. Tendencies to act in ways more or less definite on the application of proper stimuli, when no feeling is present in the sensorium, are respectively known as reflex or automatic actions, the stimuli being external in the former case and internal in the latter case.

The two kinds of emotive tendencies mentioned are separated by no well defined boundary. Emotions accompanied by feeling, when oft repeated, tend to become automatic, while emotions ordinarily unaccompanied by feeling may, in the absence of higher emotions, send impressions to the sensorium.

Instincts comprise a class of emotions, connecting emotions accompanied by feeling with those unaccompanied by feeling.

Confining our attention to what is commonly known as an emotion, it is apparent that the feeling accompanying each is pleasurable or painful. When the feeling is pleasurable the tendency is to continue the course of action entered upon; on the other hand, when the feeling is painful, the tendency is to desist

from the course of action which has as its concomitant the painful feeling. Pleasurable emotions might be defined as attractive and painful emotions, as repulsive inclinations or tendencies. Objects which by their stimuli bring about attractive or repulsive tendencies, are pleasurable or painful. It is needless to say that the pleasurable or painful elements are frequently so combined in an emotion, that it is difficult to determine whether the compound is pleasurable or painful. Looking at the physiological concomitants of these two broad classes of emotions, evidence seems to sanction the view that pleasurable emotions are accompanied by well-sustained, while painful emotions are accompanied by ill-sustained, nervous actions. Physiologically viewed, a pleasurable emotion is a nervous action wherein the nervous energy does not sink below a certain level, the repairs afforded by nutritive substances keeping it above that level. The physiological aspect of pain is waste exceeding repair, the nervous energy thus sinking below a certain level.

Ignoring feeling altogether, it must follow that a creature with no hereditary paths of action already cut in its nervous mechanism would act mainly in lines where its movements were well sustained. Such movements would, in the long run, come to have a preponderance over ill-sustained or painful movements. Moreover, movements from a source of pain being better sustained than movements towards that source would eventually prevail. Consequently the repulsive nature of pain is a physiological consequence. Feelings accompanying attractive and repulsive tendencies are by association pleasurable or painful. If these conclusions be granted, we have an explanation of the emotions and of that totality of emotional influence which constitutes will, as Professor Bain has pointed out.

Now the actions of every individual under an emotional stimulus of any nature, are determined not only by his own experiences, but by a vast experience of pains and pleasures bequeathed to him by his ancestors. Accordingly in studying the actions which are the objective expressions of various emotions, it is necessary to consider the ancestral as well as the individual experience which has made the particular expression what it is. The antithesis of painful and pleasurable emotions is Darwin's limited "principle of antithesis" extended so as to include all emotional expression. Speaking broadly the expression of pain-

ful emotions is a relaxed state of the muscles while pleasurable emotions are expressed by a vigorous action of the muscles. This general statement needs modification in some cases where, as often happens, pleasurable and painful emotions are combined, or where the emotion, though painful, is expressioned by movements from the source of pain, such movements, as before stated, being better sustained than movements in the opposite direction. Granting this fact, it must still be admitted that pain, *per se*, often is a strong stimulus in provoking muscular contraction. The writhings of one in pain are not simply movements from a source of pain. Yet even in such cases the action is not long continued, and is apt to exhaust itself sooner than actions expressive of pleasure. Moreover such actions, under painful stimuli, are in a certain sense movements from a source of pain, for the contraction of the muscles, by bringing about vascular dilation, draws the blood from the over excited nerve centers; consequently the excessive nervous action is lessened by their contraction. A proper understanding of what has already been said concerning emotions in general will be of assistance in the study of particular emotional phases which it is the writer's purpose very briefly to discuss. The study of the whole field of emotional expression, at once precise and philosophic, attempted by Darwin, is fully appreciated by naturalists. There remains, however, many points of interest connected with emotional expression, where an extension of Darwin's views is possible. In his "Expression of the emotions" Darwin appears to have based his order of presentation on no classification of the emotions, moreover he occasionally presents his "principle of antithesis" as an explanation of emotional expression where the actions might be better explained on the universal principle of pleasure sought or pain avoided. For instance, the shrugging of the shoulders as indicative of helplessness is explained by Darwin, on his principle of antithesis, as being the contrary of emotions expressive of effort or determination. It would appear more philosophic to ascribe such acts to incipient *cringing* or cowering. Helplessness implies an obstacle which cannot be resisted or overcome. Now it must be obvious that when a creature meets an adversary too powerful to be resisted or avoided, the only course to pursue is to lessen the pain of chastisement which the powerful adversary may inflict. If its adversary be a bully of its own species, capable of being pacified by propitiatory movements, the movements of the weaker creature serve a dou-

ble purpose. The actions of the creature are necessitated by the universal law of movement in paths of pleasure.

The movements in the case under consideration would be the protection of the softer and more sensitive portions of the body by the harder and more callous parts. Accordingly the viscera are protected by leaning forwards, by bringing the elbows to the side and by spreading out the hands. The head is at the same time depressed, presenting the less sensitive portions instead of the more sensitive face, while the shoulders are elevated so as to cover the more sensitive neck. Putting all these movements together, we have the expression of abject helplessness denominated cringing. But when for an aggressive and unavoidable adversary, we substitute an insuperable obstacle, we notice the same element of helplessness without the obvious need of self-protection. There are, however, similar elements in both cases. Consequently by "substitution of similars," a process almost as general in association as in reasoning proper, we have that likeness of expression which a helpless shrug of the shoulders indicates. The truth or falsity of this explanation of the impotent shrug does not affect the general law of emotional expression or lessen the necessity of reducing all particular expressions to various phases of the same law. Taking the simpler emotions, of which the distinctive expressions have been explained by Darwin's researches, it is possible to arrange them according to their respective intensities on the scale of pleasure and pain.

Their respective positions on the scale would be somewhat as follows:

- *Pleasurable*
  - Intense, expressed by
    - Bright eyes.
    - Laughter, and
    - Partially contracted muscles.
  - Less intense, including complacency, etc., expressed by incipient smiles.
- *Mixed*
  - Anger, sullenness—expressed more or less distinctly by the actions of conflict.
- *Painful*
  - Intense
    - Agony, fear, astonishment, expressed by open mouth, contracted occipito-frontalis and corrugators in some cases.
    - Grief, despair, helplessness, etc., expressed by relaxed muscles, indicating the exhaustion from flight or pain.
  - Less intense
    - Guilt, shyness, etc., characterized by self-attention, inducing blushes through the agency of the vaso-motor mechanism.

The pleasurable emotions very briefly outlined in the table do not call for much comment. The joint cause of laughter may be suggested. The nervous activity which is the concomitant of pleasurable feeling must be discharged by the motor channels. Movements in lines of least resistance would take place in the most worn channels. Such channels are obviously those connected with automatic actions, such as breathing, which are constantly open; consequently the movements of the diaphragm result. But in order to fully explain laughter the interrupted character of the expiratory blast must be explained. Now it is perfectly obvious that an element of surprise is an important factor in the production of laughter. Surprise is accompanied by a powerful inspiration and the sudden diversion of nerve currents from their previous channels. This inspiration of surprise would have to be followed by a strong expiration which, however, is modified by movements of the respiratory muscles induced by the pleasurable stimulus and by the diverted nerve currents which find their exit through the most open channels.

The composite character of the emotions classed as mixed emotions may need some explanation. Anger with men commonly results from some insult which detracts from self-esteem. The effort is then made to regain that esteem at the cost of the insulter. There is present in consciousness self-humiliated and a representation of the insulter humiliated. More generally stated, anger implies simply the effort to remove or attack any pain-inflicting agency. In that event there is present in the mind the same two elements of pain and pleasure, weakness and strength, viz., the pain inflicted and a sense of personal power able to resist the pain.

Astonishment when unmixed is, judging from its close likeness to fear, a painful emotion. To the animal in its wild state any strange creature must, in most cases, be either its prey or its destroyer, consequently there is the open-mouthed inspiration, explainable, as Darwin has shown, as the inspiration which precedes efforts to escape or attack, while the open mouth also renders respiration less noisy, thus assisting the concentration of the attention on the strange object. Astonishment seems to have been primarily derived from a disagreeable surprise resulting from the unexpected apparition of a destroyer. Shyness is probably due to this same unpleasantness associated with strangers, aggravated in the case of man by the known propensity of strangers to criticise our appearance. Hence attention is called to self, causing blushing.

THE DEVELOPMENTAL SIGNIFICANCE OF HUMAN PHYSIOGNOMY.[1]

BY E. D. COPE.

THE ability to read character in the form of the human face and figure, is a gift possessed by comparatively few persons, although most people interpret, more or less correctly, the salient points of human expression. The transient appearances of the face reveal temporary phases of feeling which are common to all men; but the constant qualities of the mind should be expressed, if at all, in the permanent forms of the executive instrument of the mind, the body. To detect the peculiarities of the mind by external marks, has been the aim of the physiognomist of all times; but it is only in the light of modern evolutionary science that much progress in this direction can be made. The mind, as a function of part of the body, partakes of its perfections and its defects, and exhibits parallel types of development. Every peculiarity of the body has probably some corresponding significance in the mind; and the causes of the former, are the remoter causes of the latter. Hence, before a true physiognomy can be attempted, the origin of the features of the face and general form must be known. Not that a perfect physiognomy will ever be possible. A mental constitution so complex as that of man cannot be expected to exhibit more than its leading features in the body; but these include, after all, most of what it is important for us to be able to read, from a practical point of view.

The present essay will consider the probable origin of the structural points which constitute the permanent expression. These may be divided into three heads, viz: (1) Those of the general form or figure; (2) Those of the surface or integument of the body with its appendages; and (3) Those of the forms of the head and face. The points to be considered under each of these heads are the following:

I. The General Form.

1. The size of the head.
2. The squareness or slope of the shoulders.
3. The length of the arms.
4. The constriction of the waist.
5. The width of the hips.

[1] Abstract of a lecture delivered before the Franklin Institute of Philadelphia, Jan. 20, 1881, in exposition of principles laid down in The Hypothesis of Evolution, New Haven, 1870, p. 31.

6. The length of the leg, principally of the thigh.
7. The sizes of the hands and feet.
8. The relative sizes of the muscles.

II. The Surfaces.

9. The structure of the hair (whether curled or not).
10. The length and position of the hair.
11. The size and shape of the nails.
12. The smoothness of the skin.
13. The color of the skin, hair and irides.

III. The Head and Face.

14. The relative size of the cerebral to the facial regions.
15. The prominence of the forehead.
16. The prominence of the superciliary (eyebrow) ridges.
17. The prominence of the alveolar borders (jaws).
18. The prominence and width of the chin.
19. The relation of length to width of skull.
20. The prominence of the malar (cheek) bones.
21. The form of the nose.
22. The relative size of the orbits and eyes.
23. The size of the mouth and lips.

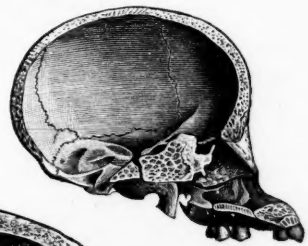


Fig. 2.

Fig. 1.

FIG. 1.—Section of skull of adult orang-outang (*Simia satyrus*). FIG. 2.—Section of skull of young orang, showing relatively shorter jaws and more prominent cerebral region.

The significance of these, as of the more important structural characters of man and the lower animals, must be considered from two standpoints, the palæontological and the embryological. The immediate palæontological history of man is unknown, but may be easily inferred from the characteristics displayed by his nearest relatives of the order Quadrumana. If we compare these animals with man, we find the following general differences. The numbers correspond to those of the list above given.

I. As to General Form.—(3) In the apes the arms are longer; (8) the extensor muscles of the leg are smaller.

II. As to surface.—(9) The body is covered with hair which is not crisp or wooly; (10) the hair of the head is short; (13) the color of the skin, etc., is dark.

III. As to Head and Face.—(14) The facial region of the skull is large as compared with the cerebral; (15) the forehead is not prominent, and is generally retreating; (16) the superciliary ridges are more prominent; (17) the edges of the jaws are more prominent; (18) the chin is less prominent; (20) the cheek bones are more prominent; (21) The nose is without bridge, and with

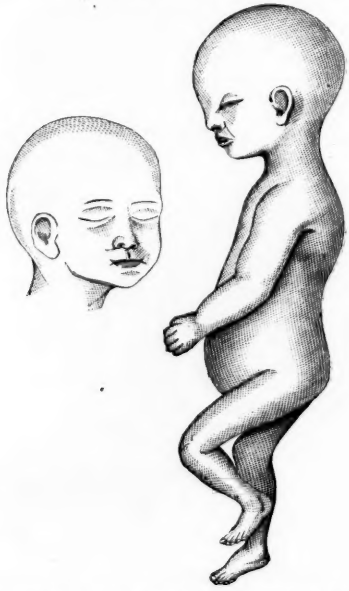


FIG. 3.—Figure of infant at birth; *a*, front of face.

short and flat cartilages; (22) the orbits and eyes are smaller (except in Nyctipithecus); (24) the mouth is small and the lips are thin.

It is evident that the possession of any one of the above characteristics by a man approximates him more to the monkeys, so far as it goes. He retains features which have been obliterated in other persons in the process of evolution.

In considering the physiognomy of man from an embryological standpoint, we must consider the peculiarities of the infant at birth. The numbers of the following list correspond with those already used (Fig. 3).

I. As to the General Form.—(1) The head of the infant is relatively much larger than in the adult; (3) the arms are relatively longer; (4) there is no waist; (6) the leg, and especially the thigh, are much shorter.

II. As to the Surfaces.—(10) The body is covered with fine hair, and that of the head is short.

III. The Head and Face.—(14) The cerebral part of the skull greatly predominates over the facial; (16) the superciliary ridges are not developed; (17) the alveolar borders are not prominent; (20) the malar bones are not prominent; (21) the nose is without bridge and the cartilages are flat and generally short; (22) the eyes are larger.

It is evident that persons who present any of the characters cited in the above list are more infantile or embryonic in those respects than are others; and that those who lack them have left them behind in reaching maturity.

We have now two sets of characters in which men may differ from each other. In the one set the characters are those of monkeys, in the other they are those of infants. Let us see whether there be any identities in the two lists, *i. e.*, whether there be any of the monkey-like characters which are also infantile. We find the following to be such:

I. As to General Form.—(3) The arms are longer.

II. Surface.—(10) The hair of the head is short, and the hair on the body is more distributed.

III. As to Head and Face.—(21) The nose is without bridge and the cartilages are short and flat.

Three characters only out of twenty-three. On the other hand

the following characters of monkey-like significance are the opposites of those included in the embryonic list: (14) The facial region of the skull is large as compared with the cerebral; (15) the forehead is not prominent; (16) the superciliary ridges are more prominent; (17) the edges of the jaws are more prominent. Four characters, all of the face and head. It is thus evident that in attaining maturity man resembles more and more the apes in some important parts of his facial expression.

Fig. 4.

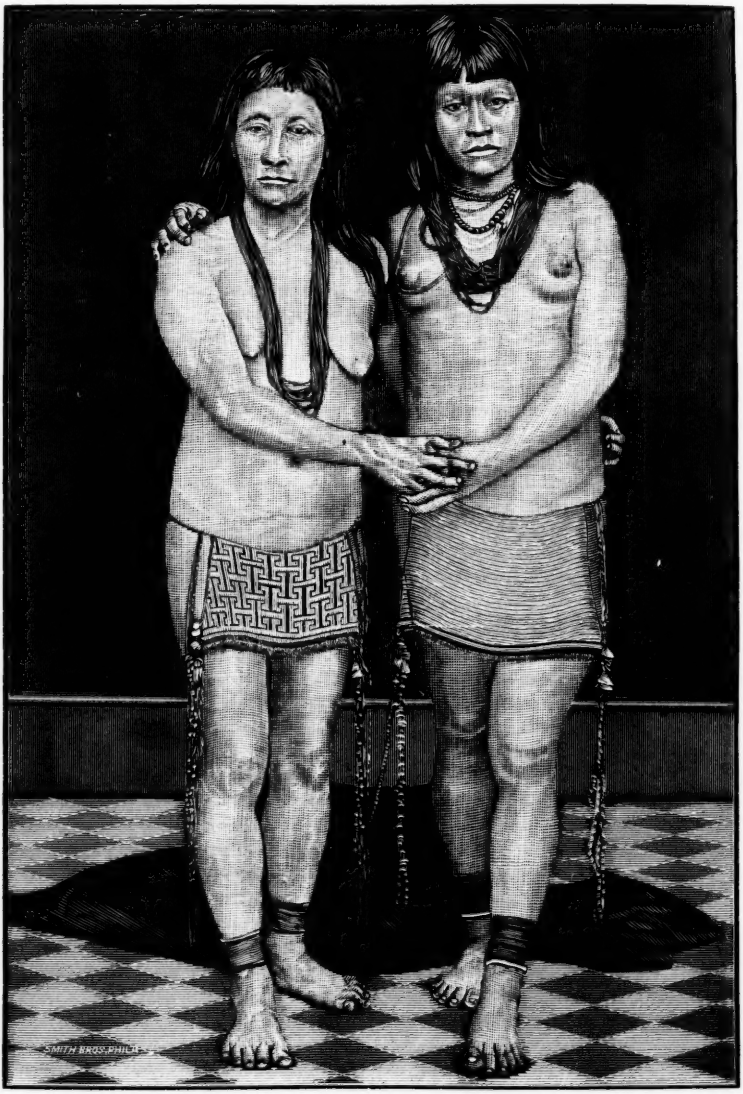
Fig. 5.

FIG. 4.—Portrait of a girl at five years of age. FIG. 5.—Portrait of the same at seventeen years, showing the elongation of the facial region, and less protuberance of the cerebral.

It must be noted here that the difference between the young and embryonic monkeys and the adults, is quite the same as those just mentioned as distinguishing the young from the adult of man (Figs. 1–2). The change, however, in the case of the monkeys is greater than in the case of man. That is, in the monkeys the jaws and superciliary ridges become still more prominent than in man. As these characters result from a longer course of growth from the infant, it is evident that in these respects the apes are more fully developed than man. Man stops short in the development of the face, and is in so far more embryonic.[1] The prominent forehead and reduced jaws of man are characters of "retar-

[1] This fact has been well stated by C. S. Minot in the NATURALIST for 1882, p. 511.

PLATE XIII.



Esequibo Indian women, showing the following peculiarities: deficient bridge of nose, prognathism, no waist, and (the right hand figure) deficiency of stature through short femur. From photographs by Endlich.

dation." The characters of the prominent nose with its elevated bridge, is a result of "acceleration," since it is a superaddition to the quadrumanous type from both the standpoints both of palæontology and embryology.[1] The development of the bridge of the nose is no doubt directly connected with the development of the front of the cerebral part of the skull and ethmoid bone, which sooner or later carries the nasal bones with it.

If we now examine the leading characters of the physiognomy of three of the principal human sub-species, the Negro, the Mongolian and the Indo-European, we can readily observe that it is in the two first named that there is a predominance of the quadrumanous features which are retarded in man; and that the embryonic characters which predominate are those in which man is accelerated. In race description the prominence of the edges of the jaws is called prognathism, and its absence orthognathism. The significance of the two lower race characters as compared with those of the Indo-European, is as follows:

Negro.—Hair crisp (a special character), short (quadrum. accel.); prognathous (quadrum. accel.); nose flat, without bridge (quadrum. retard.)[2]; malar bones prominent (quadrum accel.); beard short

Fig. 6. Fig. 7.

FIG. 6.—Profile of a Luchatze negro woman, showing deficient bridge of nose and chin, and elongate facial region and prognathism. FIG. 7.—Face of another negro, showing flat nose, less prognathism and larger cerebral region. From Serpa Pinto.

[1] See Cope, the Hypothesis of Evolution, New Haven, 1870, p 31.

[2] In the Bochimaus, the flat nasal bones are coössified with the adjacent elements as in the apes (Thulié).

(quadrum. retard.); arms longer (quadrum. accel.); extensor muscles of legs small (quadrum. retard).

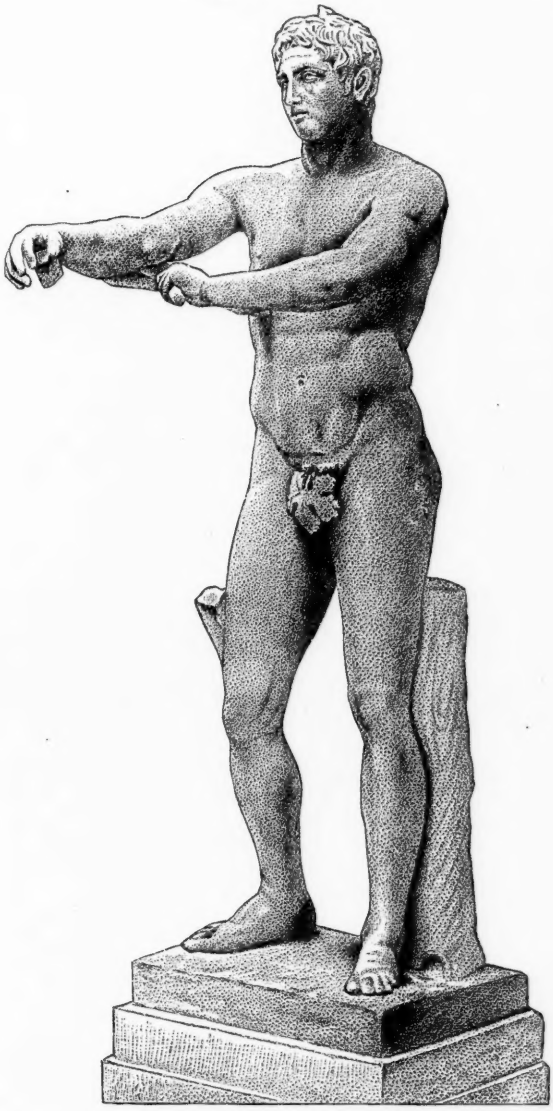
Mongolian.— Hair straight, long (accel.); jaws prognathous (quadrum. accel.); nose flat or prominent with or without bridge; malar bones prominent (quadrum. accel.); beard none (embryonic); arms shorter (retard.); extensor muscles of leg smaller (quad. retard.).

FIG. 8.—Portrait of Satanta, a late chief the Kiowas (from the Red river of Texas), from a photograph. The predominance of the facial region, and especially of the malar bones, and the absence of beard, are noteworthy,

Indo-European.—Hair long (accel.); jaws orthognathous (embryonic retard.); nose (generally) prominent with bridge (accel.); malar bones reduced (retard.); beard long (accel.); arms shorter (retard.); extensor muscles of the leg large (accel.).

The Indo-European race is then the highest by virtue of the acceleration of growth in the development of the muscles by which the body is maintained in the erect position (extensors of the leg), and in those important elements of beauty, a well-developed

PLATE XIV.



The Wrestler; original in the Vatican. This figure displays the characters of the male Indo-European, except the beard.

nose and beard. It is also superior in those points in which it is more embryonic than the other races, viz., the want of prominence of the jaws and cheek-bones, since these are associated with a greater predominance of the cerebral part of the skull, increased size of cerebral hemispheres, and greater intellectual power.

A comparison between the two sexes of the Indo-Europeans expresses their physical and mental relations in a definite way. I select the sexes of the most civilized races, since it is in these, according to Broca and Topinard, that the sex characters are most pronounced. They may be contrasted as follows. The numbers are those of the list on page 618 already used. I first consider those which are used in the tables of embryonic, quadrumanous and race characters:

MALE.	FEMALE.
I. The General Form.	
2. Shoulders square.	Shoulders sloped.
4. Waist less constricted.	Waist more constricted.
5. Hips narrower.	Hips wider.
6. Legs longer.	Legs shorter.
8. Muscles larger.	Muscles smaller.
II. The Integuments, etc.	
10. More hair on body, that of head shorter; beard.	Less hair on body, that of head longer; no beard.
12. Skin rougher (generally).	Skin smoother.
III. The Head and Face.	
16. Superciliary ridges more prominent.	Superciliary ridges low.
22. Eyes often smaller.	Eyes often larger.

The characters in which the male is the most like the infant are two, viz., the narrow hips and short hair. Those in which the female is most embryonic are five, viz., the shorter legs, smaller muscles, absence of beard, low superciliary ridges and frequently larger eyes. To these may be added two others not mentioned in the above lists; these are (1) the high pitched voice, which never falls an octave as does that of the male; and (2) the structure of the generative organs, which in all Mammalia more nearly resemble the embryo and the lower Vertebrata in the female than in the male. Nevertheless, as Bischoff has pointed out, one of the most important distinctions between man

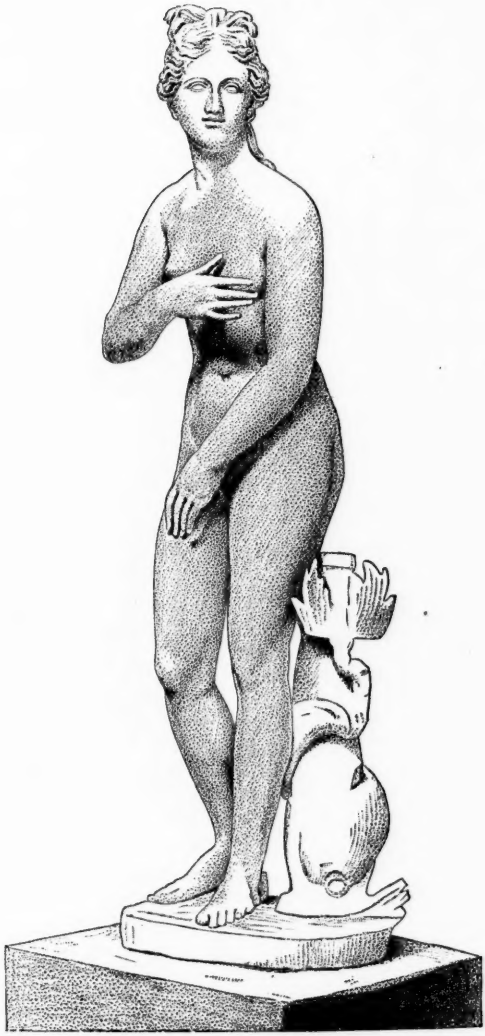
and the apes is be found in the external reproductive organs of the female.

From the preceding rapid sketch the reader will be able to explain the meaning of most of the peculiarities of face and form which he will meet with. Many persons possess at least one quadrumanous or embryonic character. The strongly convex upper lip frequently seen among the lower classes of the Irish is a modified quadrumanous character. Many people, especially those of the Sclavic races, have more or less embryonic noses. A

FIG. 9.—Australian native (from Brough Smyth), showing small development of muscles of legs, and prognathism.

retreating chin is a marked monkey character. Shortness of stature is mostly due to shortness of the femur, or thigh; the inequalities of people sitting are much less than those of people standing. A short femur is embryonic; so is a very large head.

PLATE XV.



The Venus of the Capitol (Rome). The form and face present the characteristic peculiarities of the female of the Indo-European race.

The faces of some people are always partially embryonic, in having a short face and light lower jaw. Such faces are still more embryonic when the forehead and eyes are protuberant. Retardation of this kind is frequently seen in children, and less frequently in women. The length of the arms would appear to have grown less in comparatively recent times. Thus the humerus in most of the Greek statues, including the Apollo Belvidere, is longer than those of modern Europeans, according to a writer in the Bulletin de la Société d' Anthropologie of Paris, and resembles more nearly that of the modern Nubians than any other people. This is a quadrumanous condition. The miserably developed calves of many of the savages of Australia, Africa and America, are well known. The fine swelling gastrocnemius and soleus muscles characterize the highest races, and are most remote from the slender shanks of the monkeys. The gluteus muscles developed in the lower races as well as in the higher, distinguish them well from the monkeys with their flat posterior outline.

Some of these features have a purely physical significance, but the majority of them are, as already remarked, intimately connected with the development of the mind, either as a cause or as a necessary coincidence. I will examine these relations in a future article.

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EDITORS' TABLE.

EDITORS: A. S. PACKARD, JR., AND E. D. COPE.

—— The late meeting of the National Academy of Sciences was, in some respects, a noteworthy one. In the election of new members it showed that official relations at the seat of government do not constitute a passport of admission to its circle. The Academy evidently prefers that it shall furnish candidates for governmental responsibilities rather than that the Government shall furnish it with members. On the other hand it partially abandoned its usual reserve in favor of pure science, and elected two members whose services have been chiefly in the field of applied science.

The academy appointed a committee to consider its relations with the Government. One of the questions that should be agi-

tated is that of the compensation of its members. The members of the French Academy receive a salary, and are paid for attendance besides. Additional compensation is given for labor on some of the committees. The government of Russia pays the members of its academy $2000 per annum, and gives them excellent lodgings in the academy building. The United States, with its high esteem for education and scientific investigation, should not do less than the autocratic government of Russia, whose treasury is depleted, and whose people are so largely uneducated. As the case now stands, in our so-called democratic country, many members cannot attend the meetings on account of the necessary expense, and none but rich men can hold some of the leading offices.

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RECENT LITERATURE.

NORWEGIAN NORTH ATLANTIC EXPEDITION, 1876–8.[1] — This valuable memoir was forwarded to the editorial committee in January, 1881, and proofs of the plates had been distributed some months earlier, but the publication has been delayed until now. It contains a review of the species of Buccinidæ native to the Northern and Arctic Atlantic ocean and its connecting waters. Most of the less-known forms are figured, together with the nuclear whorls, oötheca and dentition of a majority of species mentioned. The species treated of are *Chrysodomus turtoni* Bean, for which the new genus Jumala is proposed; to which also the *Neptunea ossiani* Friele, is referred; *Volutopsis norvegicus* Chemn., *Pyrolofusus deformis* Rve.; *Neptunea despecta* L. and varieties; *N. (Sipho) islandica* Ch.; *N. (Sipho) turgidula* Jeffr.; *gracilis* Da Costa (+ *glaber* Verkr.); *hanseni* Friele; *virgata* Friele; *curta* Jeffr.; *kroyeri* and *latericea* Möller; the sub-genus Siphonorbis with species *ebur* Mörch, *fusiformis* Brod., *dalli* Friele, n. s., *turrita* M. Sars, *lachesis* Mörch, *undulata* Friele n. s., *danielsseni* Friele, and varieties; the sub-genus Mohnia with *M. mohni* Friele; *Troschelia berniciensis* King; Buccinum with the following species: *B. undatum* with varieties, *ciliatum* Fabr., *gröndlandicum* Chemn., *undulatum* Müller, *finmarkianum* Verkr., *humphreysianum* Bennett, *hydrophanum* Hanc., *nivale* and *sulcatum* Friele (n. spp.), *terra-novaæ* Beck, *glaciale* L., and *tenue* Gray.

It will thus be seen that this work contains rich material for the consideration of the student of Arctic mollusks and of groups in which discrimination is of extreme difficulty, as is fully recognized

[1] *Norwegian North Atlantic Expedition, 1876–8.* Zoology VIII. Mollusca, I Buccinidæ. By HERMAN FRIELE. 4to, pp. 37, with six plates and one map. Christiania (Dec.), 1882.

by the author. Probably no two naturalists could be found who would agree on the systematic place or relations of all the forms of Arctic Buccinidæ which have been described. But we have not seen any discussion of them with which we felt a more general accordance than that in Mr. Friele's work. In regard to the general relations of the group we feel that the limits of Troschel in this, as in many other cases, are too narrow, and his distinctions for family rank too refined and too exclusive. In dental, as in other characters, the time is at hand for naturalists, who may not yet have done so, to realize that easy transitions from one group to another exist in a majority of cases and may be found by sufficient search. The genus Jumala of Friele, bears somewhat such a relation to Strombella Gray, as Liomesus Stimpson, does to some forms of Sipho. The median plate of the radula is edentulous. In this it agrees with Beringius Dall (1879), and a doubt arises as to their distinctness from each other. The type of Beringius is *Chrysodomus crebricostatus* Dall, from Alaska. The only criticism which occurs to us relates to one of the figures. We doubt extremely whether the oötheca figured as belonging to *Buccinum terra-novæ* Beck (Pl. III, f. 16, *a-b*), does not rather appertain to a Neptunea, as it resembles precisely that of several small forms of Neptunea allied to *despecta*, familiar to us in the northern seas, while we have never met with oötheca of such form belonging to a true Buccinum.—*W. H. Dall.*

Godman and Salvin's Biology of Central America.[1]—This standard work on the zoölogy and botany of Central America and Mexico, though almost purely descriptive in its character, is of high value both from the carefully prepared text and well executed colored and plain plates. It will prove of particular value to the American biologist as it indicates in many cases the zoögeographical limits of many United States' species. Indeed, for a broad study of our mammalian and avi-fauna as well as our entomology, reference to this work will be indispensable. The editors, after several years' explorations in different parts of Central America, have put their collections into the hands of specialists for description. It is announced, however, that the editors will give, at the conclusion of the work, an introductory volume, wherein the physical features of the country will be described and illustrated with maps.

The mammalia have been enumerated and described by the late E. R. Alston, and the text occupies portions of the first seven numbers, and is illustrated with eighteen chromo-lithograph plates, drawn by Wolf, Smit and Keulemans, a guarantee of their excellency. Mr. Alston has brought together what little is known of the

[1] *Biologia Centrali-Americana; or, Contributions to the Knowledge of the Fauna and Flora of Mexico and Central America.* Edited by F. Ducane Godman and Osbert Salvin. Zoölogy, parts 1–15. Botany, parts 1–12. 4to. London, 1879–1882.

habits and distribution of the mammals. For the first time we have definite information regarding the monkeys of Central America and Mexico, comprising, as they do, perhaps, the most striking feature of the region under consideration. There are eleven species, representing two families, and six out of ten genera of American monkeys in all. The existence of monkeys north of the Isthmus of Panama was long overlooked by zoölogists, though recorded by several of the older zoölogists, notably Dampier (Voyages, 1729). Apparently the species which extends farthest north is the Mexican spider monkey (*Ateles vellerosus* Gray); it occurs in Guatemala from coast to coast. In Mexico it has not been found, according to Reichardt, north of a point in Vera Cruz, near the volcano of Orizaba, where it is common, living in small troops in the deep ravines up to an elevation of 2000 feet above the sea. Reinhardt "also found it at a height of 4000 feet in the eastern parts of Oaxaca, but never on the Pacific slope of the Cordillera in that State; and he believed that monkeys were not to be found on the western coast further north than Tehauntepec."

We are afforded fresh data concerning the distribution of the Carnivora; the opinion of Dr. V. Frantzius is quoted that the coyote is not indigenous to this region, but spread through Central America subsequent to the Spanish conquest. "He considers it improbable that they should have existed among the thick population of the semi-civilized natives who then occupied the western slopes, and thinks that their invasion may have been coincident with that of the European cattle, which were introduced in the first decade of the sixteenth century." A drawing by Mrs. Salvin of a specimen of common skunk (*Mephitis mephitica*) in the museum of Guatemala is the only positive evidence of the range of this species into Guatemala, as it was not represented in Messrs. Godman and Salvin's collections.

The two Central American tapirs are discussed with considerable detail; although the adult of Baird's tapir was not discovered, both species are figured and their distribution partly ascertained. We are also treated to an excellent colored illustration of the manatee, which is common on the eastern coast; Dampier still remains the best authority as to its mode of life. The two species of peccary are illustrated, and interesting accounts of their habits are given; the collared peccary ranging from "36° north latitude on the Red river of Arkansas, and as far south as the Rio Negro of Patagonia." In Guatemala "the collared peccary is usually seen in parties of five or six individuals in the forest, but in the early morning they trespass into the clearings." The white-lipped peccary goes in large droves in Guatemala as well as in Costa Rica, where they abound most in "the thick primeval forests of the warmer lowlands," but is also met with in the higher-lying mountain woods.

The antelope is not found south of Sonora and Chihuahua. Mr.

Clark is quoted as stating that in this region "the antelope is said to have an abiding hatred for the rattlesnake, which it decoys first into a striking attitude and then utterly annihilates by leaping into the air and coming down upon the snake with its four sharp-cutting hoofs placed together." (See the illustration in the NATURALIST on p. 179.)

The birds are being treated in the same manner as the mammals by Messrs. Salvin and Godman; the reptiles, amphibians and fishes, by Dr. Günther; the mollusks, by Dr. E. von Martens; the crustacea, by Professor Huxley; the arachnida, by Rev. O. P. Cambridge; the coleoptera, by H. W. Bates and others, including Dr. D. Sharp and C. O. Waterhouse; the hymenoptera, by P. Cameron; the butterflies, by Godman and Salvin, and the moths by H. Druce; the neuroptera, by Mr. McLachlan; the orthoptera, in part, by J. Wood Mason, and the rhynchota, by W. L. Distant. The botanical portion is entirely in the hands of Mr. W. B. Hensley.

RECENT WORKS ON THE MOUTH-PARTS OF FLIES.[1]—The object of this notice is simply to draw attention to some excellent recent works on the structure and morphology of the mouth-parts of insects, particularly the flies. Dr. Dimmock's memoir is largely devoted to the parts of the mosquito's mouth, and is therefore of considerable popular interest; but the author's object was not simply to describe the anatomy of the mouth-parts of this familiar insect alone, but to give a general comparative account of those of Diptera in general. As Dr. Dimmock says: "The few Diptera whose mouth-parts have been the object of the anatomical studies, the results of which are noted in the following pages, were chosen, on the one hand, with especial reference to their presenting a series beginning with a species possessing simple, separate and fully-developed mouth-parts, and ending with a species of which the complexity of the mouth-parts was due to coalescence and incomplete development of their different elements, and, on the other hand, with partial reference to forms whose mouth-parts were of sufficient length to render their study of sections, made with the microtome, of value in determining their relative length, their positions and their attachments. With the above-mentioned objects in view species of the genera Culex, Bombylius, Eristalis and Musca were chosen." The figures are well drawn, with transverse sections of the proboscis and longitudinal sections, showing

[1] *The Anatomy of the mouth-parts and of the sucking apparatus of some Diptera.* Dissertation for the purpose of obtaining the Philosophical Doctorate at the Leipzig University. By GEORGE DIMMOCK. Boston, A. Williams & Co., 1881. 4to, pp. 50. 4 plates.

Fluernes Munddele. Trophi Dipterorum. Af FR. MEINERT. Kjöbenhavn, 1881. 4to, pp. 91. 6 plates.

Zur Kenntniss der mundtheile der Dipteren. Von EDUARD BECHER. Besonders abgedruckt aus dem XLV. Bande der Denkschriften der Math.-Naturwissen. classe der K. Akad. der Wissenschaften. Wien, 1882. 4to, pp. 42. 4 plates.

in an instructive manner the relations of the œsophagus to the mouth and proboscis.

It appears that complicated as are the mouth-parts of the Diptera, the mandibles are least developed, or most often absent. They are present in the female Culex, but are absent in Eristalis, Bombylius, Musca and many other Diptera.

The maxillæ are, next to the mandibles, the oftenest absent in Diptera, but the maxillary palpi are usually, probably always, present. The labium is the most fully developed part of the mouth, the large fleshy lobes so well developed in the house fly being termed the *labellæ*. It appears that the mouth-parts are most developed in the mosquito, which for this and other reasons stands at the head of the Diptera.

As to the poisonous nature of the mosquito's bite Dr. Dimmock's views may be considered as most probably correct. He says: "After having experimented a large number of times with the living mosquito, I am convinced that there is use made of a poisonous saliva. * * * When the insect is allowed to draw its fill on the back of my hand, the subsequent swelling lasts from forty to forty-eight hours, and the amount of poisonous effect upon me, as proved by numerous experiments, is in direct proportion to the length of time which the Culex has occupied in actually drawing blood. The above-mentioned facts would indicate a constant outpouring of some sort of poisonous fluid during the blood-sucking process, and would necessitate a tube or channel for its conduction. Now, no other channel exists through which saliva could pass from the base to the tip in the mouth-parts which Culex inserts in the skin, and this, together with the position occupied by the salivary duct in other Diptera, leads me to believe, without as yet being able to give anatomical proof of it, that the hypopharynx of Culex contain a duct that pours out its poisonous saliva."

Dr. Meinert's memoir is very well illustrated; it is in Danish, with a brief Latin synopsis. His work, while exact in its description of actual parts, appears to us to be lacking in philosophic breadth. For instance, he has some singular views as to the general homologies of the trophi of insects, especially Diptera. He uses Kirby and Spence's terms *cultellus* for mandibles and *scalpella* for the maxillæ of Diptera. But his illustrations of the trophi of numerous Diptera are made with great apparent care and faithfulness.

Becher's work is not so well illustrated as the foregoing, though the number of genera represented is greater, as types of each dipterous family are represented; the descriptions are rather brief. None of the authors compare the mouth-parts of the flea with those of other Diptera, Becher only figuring the underlip of Pulex.

The latest article is a short preliminary one by Dr. Kraepelin,

in the *Zoölogischer Anzeiger* (1882), translated in the Journal of the Royal Microscopical Society for February. This paper is on the mouth-organs of sucking insects. After describing the mode of taking food in the bees and bugs, which we refer to at another place, he deals at greater length with the Diptera. He dissents from Dimmock's and Meinert's view, that the labium of these flies is made up of the labium proper and the epipharynx, but considers the paired organs described by Meinert in Hippobosca, &c., as an independently formed epipharynx, to be enormous developments of the cheeks. The tactile hairs of the labella are connected with nerves, and organs of taste are situated on the labella or fleshy "tongue." He confirms the opinions of previous observers as to the pumping arrangements of the salivary glands and the sucking apparatus of the pharynx.

MARTIN AND MOALE'S HOW TO DISSECT A BIRD.[1]—A handy little volume is this, the second part of Messrs. H. N. Martin and W. A. Moale's "Hand-book of Vertebrate Dissection." To begin by finding fault, almost the only fault that there is to find, and one that is doubtless caused by the low price at which the book is issued—the illustrations are too few and too rudimentary.

The pigeon is taken as a type, and has the advantage of being readily accessible to all. The work begins by giving the zoölogical characters of the division, class and sub-order. Those of the order are omitted, and the character "sternum provided with a keel," is rather that of the order Carinatæ than that of its sub-order, Schizognathæ. The external characters of head, trunk, limbs, feathers and skin are first described, and the student is next directed how to prepare and examine the skeleton. This is followed by the dissection of the soft parts, the neck, pleuro-peritoneal cavity, veins and arteries, vocal, abdominal and reproductive organs, brain and cranial nerves, eye and ear. Clear and concise directions are everywhere given, enabling any student of ordinary dexterity and application not only to dissect a pigeon, but, better still, to dissect some other carinate bird, and note carefully the points of distinction between it and the pigeon.

MAYER'S MONOGRAPH OF THE CAPRELLIDÆ.[2]—The Caprellidæ constitute a sub-division of Amphipod Crustacea of singularly attenuated form, with less than the usual number of legs, and otherwise modified. After describing the species of the Old World, the author, apparently from want of material which it would seem our museums might have afforded, treats in a very

[1] Hand-book of Vertebrate Dissection. By H. NEWELL MARTIN, D. Sc., M. D., M.A., Professor in the Johns Hopkins University, and W. A. MOALE, M.D. Part II. How to Dissect a Bird. New York, Macmillan & Co. 60 cents.

[2] *Fauna and Flora des Golfes von Neapel und der Angrenzender Meeres-abschnitte*, Herausgegeben von der Zoölogischen Station zu Neapel. VI Monographie; Caprelliden. Von Dr. P. MAYER, mit 10 tafeln in lithographie und 39 zincographien. Leipzig, 1882. 4to, pp. 201.

inadequate way of our few described North American species. The geographical and bathymetrical distribution are then given, but the work is strongest, as one would naturally expect, in the anatomy and histology of these creatures. The nervous and muscular systems are elaborately discussed, and especially the biology of these Crustacea, which is treated of under the heads of habitats, symbiosis, mimicry and sympathetic coloring, play of chromatophores, sensibility to external influence, duration of life, molting, walking and swimming habits; parasites, etc., and phylogeny. The illustrations are numerous and excellent.

THE GEOLOGICAL RECORD FOR 1878.[1]—It is a pity that the appearance of a work of this description should be delayed nearly four years beyond the natural time of publication. The editor apologizes for the great delay in the appearance of the volume by non-arrival of the MS. of the sections America and Arctic Regions from the sub-editor of those sections. Mr. E. Wethered has undertaken, however, in future to edit the section America. Still the volume is a little larger than its predecessors, containing over 3530 entries. The list of contributors to the present volume is a long one, numbering forty-five, and the list of journals and works referred to fills twenty closely printed pages.

After giving the titles, sometimes with a very brief synopsis of works and articles on the stratigraphical and descriptive geology of different countries, those of articles on physical geology, applied and economic geology, petrology, mineralogy, palæontology, maps and sections, and miscellaneous and general geology follow in the order given. There is also a supplement for the period from 1874 to 1877 at the end of each of the above divisions.

Of course to the working geologist such a record as this must prove invaluable. The editors promise that hereafter the yearly issues will be more prompt and complete.

GEOLOGICAL SURVEY OF OHIO.[2]—The fourth volume of this survey contains reports upon the mammalia of the State, by A. W. Brayton; upon the birds, by J. M. Wheaton; upon the reptiles and amphibia, by W. H. Smith, and upon the fishes, by D. S. Jordan. The first report contains little that is new. The probability that the wild cat (*Lynx rufus*) is extinct in Ohio is stated; but of the wolf no more recent particulars are given than quotations from Dr. Kirtland, who speaks of it as very rare in 1838, and from Hildreth (Pioneer History of the Ohio Valley), who remarks that in 1848 it was nearly extinct.

Nothing is stated with regard to the abundance or even the present occurrence within the State of the gray fox; the fisher is

[1] *The Geological Record for 1878.* An account of works on geology, mineralogy and palæontology, published during the year, with supplements for 1874–1877. Edited by WILLIAM WHITAKER and W. H. DALTON. London, 1882. 8vo, pp. 496.

[2] *Report of the Geological Survey of Ohio.* Volume IV. Zoölogy and Botany. Columbus, O., 1882.

said to be "almost unknown in the Middle States;" nothing is said of the abundance or scarcity of the ermine, mink or skunk, and the same defect of localization is evident throughout. The badger "formerly extended to Ohio," and the black bear was abundant in 1805. The reader will search in vain for facts not contained in older works.

The section devoted to birds is far better. It commences with an account of the topography of the State, and in every case mentions the season at which the species appears, the localities it prefers and its abundance or scarcity. Details respecting the mode of nesting, eggs, food and habits are also systematically given. The Carolina parrot was formerly a visitor, but has not made its appearance for several years. The golden eagle is occasional, and the white-headed eagle abundant in some localities. A black vulture (*Cathartes atratus*) was observed in 1877. The white pelican is a not rare spring and fall migrant; the double-crested cormorant occurs but rarely; the Florida cormorant breeds in the State, and several gulls and terns frequent Lake Erie. The check list gives 292 species, of which only six are considered accidental. A bibliography of Ohio ornithology; a dissertation upon the relation between latitude and coloration, in which the author asserts, after a careful comparison, "that the pattern of coloration in the adults of our Northern birds is the same as that found in the young of allied Southern birds," and a glossary, conclude this section.

Ohio supports thirty-six species of reptiles and twenty-five batrachians. Of these, three are lizards and thirteen tortoises. *Lygosoma laterale* is included on the authority of Dr. Kirtland; *Cistudo clausa* and *Emys meleagris* are said to be rare; the copperhead occurs along the waters of the Mahong, Big Beaver and Muskingum rivers, and near Cleveland; *Eutænia proxima* is rare; *Tropidonotus erythrogaster* has not been seen in the State by the writer; the hog-nose snake is occasional in the north-eastern part of the State and in Scioto valley, and *Pityophis melanoleacus*, *Ophibolus calligaster*, *O. doliatus*, *Coluber obsoletus*, *Cyclophis æstivus*, *Diadophis punctatus* and *Carphophis amænus* are rare.

Of the Batrachia, *Chorophilus triseriatus* is rare, *Hyla pickeringii* is included solely on the extent of its extra-limital range, and *Spelerpes longicaudus* is rare. The genera Desmognathus and Gyrinophilus, though possessing well-marked characters, are not admitted, but are included in Plethodon and Spelerpes. Dr. Smith notes the occurrence of *Menobranchus lateralis* in the Hudson, and gives the authorities for the statement, that when its gills have been nibbled off by small fish, it can survive by cutaneous and pulmonary respiration.

In the introduction to this section several curious particulars with regard to food are given. The bull-frog will vary its insect regime by eating mice and its own species, and *Rana halecina* has

also cannibalistic habits. A toad has been observed to breakfast upon nine wasps, and dine upon eight more. It does not swallow bees and wasps immediately, but first presses them to death between its jaws, and thus avoids their sting. Insects and snails form, however, the principal food of the amphibians of the State, as well as of the lizards and smaller turtles. The danger from venomous snakes is much exaggerated, as out of the few bitten three out of four get well. This department is less valuable than the others on account of the author's manifest unacquaintance with the nature of the higher systematic analysis. The only valuable statements in this field are copied from other authors without credit. This is especially true of the Urodela, although the author states that "the classification and description" is taken "from the author's printed thesis" on this subject.

Dr. Jordan enumerates 163 species of fishes, of which forty may be considered characteristic of the lake fauna, and sixty-seven of that of the Ohio, while the remainder are common to both. This portion of the report is in every respect up to date, containing the results of the writer's own researches as well as those of other workers, and is rendered interesting by accounts of the habits of such fish as are valued by sportsmen, culled from the various sporting papers.

The entire report is much disfigured by typographical errors. Jordan is repeatedly written Jordon, *rugchos* and *rhugchos* are specimens of compositors' Greek for a snout, Lopophanes does duty for Lophophanes, sagittale sports an extra g, and so on.

King's Economic Relations of Wisconsin Birds.—This essay forms chapter XI of the report of Professor T. C. Chamberlain, State Geologist of Wisconsin, and has been prepared by Mr. F. H. King, assistant on the Survey. It comprises 269 pages of the report and is thus rather a voluminous contribution to a subject which is attracting much attention in this country, and which is one of much practical as well as biological interest. Now that our birds are described and the systematist's work is about completed, their life-histories, habits and relations to their environments are subjects still fresh and novel, and much remains to be done towards harmonizing the discordant views held as to the value of birds as insect-destroyers. The materials for the facts recorded by Mr. King were obtained from an examination of the contents of the stomachs of over 1800 birds, 1608 of which contributed results which have been incorporated in this report. From the 1608 stomachs examined the *disjecta membra* of 7663 insects were obtained. Part of his work was done in Jefferson county, Wis., and part at Ithaca, N. Y.

Mr. King estimates, from of course imperfect data, the bird population of Jefferson county at sixty-six per square mile and that of Ithaca at one hundred and fourteen per square mile. "This would give for Jefferson county a total bird population of

30,096, and for an equal area in the vicinity of Ithaca, 51,984. At the rate of sixty-six per square mile, an area somewhat less than that of our State (Wisconsin) would have a population of 3,565,000." He then, after stating some facts, concludes: "Fifty insects of the average size would certainly be a small daily allowance for the average bird. One hundred and twenty days is less than the time our summer residents are with us. At the rate assumed, each bird would consume 6000 insects. This would give as the aggregate number of insects consumed by the birds calculated to occupy an area equal to that of our State, the enormous total of 21,384,000,000. Add to this amount the work which these birds do in their Southern homes, and we have a low estimate of the influence they exert over insect life." After discussing a number of topics, the author devotes the body of the essay to an account, original and compiled, of the insectivorous habits of 295 species of birds. The work is rich in new facts, is the result of a great amount of field-work, and is creditable both to the author and the State, which has called for such work. Due credit is done to Mr. S. A. Forbes, the pioneer in this line of practical biology.

THE ZOOLOGICAL RECORD FOR 1881. — *To the Editors of the* AMERICAN NATURALIST:— While thanking the editors of the AMERICAN NATURALIST for the appreciatory notice of the "Zoölogical Record" for 1881, contained in their April number, I wish to be permitted to offer some explanation on one or two points referring to that volume contained in the subsequent notice of the German "Zoologischer Jahresbericht" for the same year.

In the first place the number of papers recorded is no test of the contents of the Zoölogical Record. It is impossible to reduce the different recorders to a rigid standard, since the ideas of an expert in one branch as to the importance of his subject may differ from those of his fellow-workers on the value of detail; but the original aim (which I myself invariably kept in view when recording the Insecta) was, that only general and comprehensive papers and books should be noticed by their separate titles. Mere want of space was an important factor on this point; and it is obviously useless to give (*e. g.*) the full and often verbose title of a paper containing the description of one new species or variety, as well as the notice in its proper place of the subject of the paper.

Palæontological papers were also originally deemed not proper subjects for a zoölogical record, save in recent forms bearing on existing animals. There is, moreover, a separate medium for these papers in the Palæontological section of our "Geological Record." Here again, however, the individual opinions of the recorders have been allowed to have weight; and the marvelous discoveries in America have of course influenced them materially.

But it is in the notice of our record of Sponges that I particu-

larly wish to be allowed to make some important corrections as to facts; and I therefore add the following remarks on the subject from Mr. Stuart O. Ridley, zoölogical assistant in the British Museum, by whom the record on Spongiida was contributed:

"The remarks made in the review (at p. 395) upon the article Spongiida of the 'Zoölogical Record' for 1881 (Vol. XVIII) are almost wholly inaccurate, and it is necessary to point out one particular besides in which it is, at any rate, calculated to mislead.

"1. In the first place, the names of twelve authors are given as not having their writings even mentioned in my article.

"In point of fact, however, nine of this number are there to be found thus mentioned, viz., M. Braun at p. 4 (*ad med.*), J. W. Dawson at p. 13 (*ad fin.*), W. Dybowski at p. 6 (*ad init.*), H. (the initial *A* is apparently erroneously printed in the review) Giard at p. 6 (*ad fin.*), C. Mereschkowsky (under another form of his name, viz., De Merejkowsky) at p. 13 (*ad med.*), and as spelled in the review and in the paper apparently there referred to, in Vol. XVII (1880) of the 'Record,' at p. 2 (*ad init.*), P. Pavesi at p. 5 (*ad init.*), W. J. Sollas at p. 14 (*ad init.* and again *ad med.*), Wallich at p. 14 (*ad fin.*, three papers), E. P. Wright at p. 2 (*ad fin.*).

"The three remaining names do *not* occur in the article, for the following reasons:

"R. O. *Cunningham:* the paper evidently referred to is a short abstract of a paper on sponges generally, containing no novel facts or views.

"C. W. *Gümpel* (apparently meant for an author named Gümbel): the paper apparently intended had been already recorded in Vol. XVII, 1880, at p. 23 (*ad init.*) as belonging to the year 1880.

"T. Mayer (*P.* Mayer is evidently intended) the paper apparently intended is recorded by me under Protozoa, p. 16, as referring to a Rhizopod and not furnishing any zoölogical information about sponges.

"2. Secondly, 'some' writings by Sollas, Carter and Walcott are stated not to be mentioned by me. Comparing my article with the other similar record available for comparison, viz., the 'Zoologischer Jahresbericht' (Zoölogical Station, Naples) for the year, I find that of works by Carter, I record all those mentioned by the German work and in addition one paper at p. 1 (*ad fin.*) and a second at p. 14 (*ad fin.*). Of works by Sollas, I give all those mentioned by the sister Record except one for which see Vol. XVII (1880) p. 21 (*ad init*), and one to which an *erroneous* reference is given but which is evidently essentially identical with a paper referred to by me, Vol. XVIII, p. 14 (*ad init.*), and perhaps only an abstract of it. Of works by the third author mentioned, Walcott, I give the only one alluded to by the Jahresbericht.

"3. Thirdly, it is stated that the English Record of Sponges gives the titles of *eighteen* papers, apparently by way of disadvantageous contrast with the German work, which is stated to give more by

twenty-four, viz., forty-two. It should, however, be noticed that my article gives, at different points, full titles of twenty-five works dealing directly and of seven others dealing less directly with Sponges, and records matter relating to Sponges of *thirty-one* others, without giving their titles. Thus the total of works recorded is *sixty-three*, and not *eighteen*, as might, perhaps, be inferred from the wording of the review.

"I am therefore unable to see (with one small exception) any validity whatever in the grounds given for the statement that, as regards the literature of Sponges, the student would find the English Record imperfect."—*E. C. Rye, editor Zoöl. Record, 7 Savile Row, London, 14 April, 1883.*

[We gladly make room for the foregoing reply to our notice in the April number of this journal. The notice of the English Zoölogical Record was prepared in a kindly, appreciative spirit, least of all was it the reviewer's design to make a "disadvantageous contrast" between the English and German Records. Neither was the notice designed to reflect in any way on the accuracy of the several reporters, whose painstaking and self-sacrificing spirit is sufficiently evident. We should say frankly that we did not read with care the body of either reports, but compared the lists of works printed at the beginning of each chapter. By overlooking, as in the case of the sponges, mention of those papers not enumerated in the English Record under "Chief Works," we gave, as Mr. Ridley shows, an erroneous impression as to the completeness of the record, which we sincerely regret. At the same time, it seems to us other persons might fall into the same error, and suppose that no author was mentioned whose writings were not catalogued at the beginning of the several chapters or sections. If the names only, of authors of minor papers and notes could be added at the end of "Chief Works," etc., it would take but a few lines and be a great convenience. Apparently the German recorders have catalogued the author's writings, both "chief" and minor articles and notes, referring by number to the catalogue number, and thus secured a greater appearance of accuracy.—*A. S. Packard, Jr., for Editors* NATURALIST.]

Recent Books and Pamphlets.

Riley, C. V.—Reports of experiments upon the insects injuriously affecting the orange tree and the cotton plant. U. S. Dept. of Agriculture, Bulletin No. 1. From the author.

——Reports of observations on the Rocky Mountain locust and Chinch bug. U. S. Dept. of Agriculture, Bulletin No. 2, 1883. From the author.

Ennis, Jacob.—Two great works to be done on our sidereal system. Washington, 1883. From the author.

James, U. P.—Descriptions of new species of fossils from the Cincinnati group, Ohio and Kentucky. Ext. from the Palæontologist. Cincinnati, April, 1883. From the author.

Hinckley, Mary H.—Notes on the developmeut of *Rana sylvatica*. Ext. Proc. Bost. Soc. Nat. Hist., Oct., 1882. From the author.

Kingsley, J. S.—Some points in the development of *Molgula manhattensis*. Ext. Proc. Bost. Soc. Nat. Hist., March, 1882. From the author.

Hinds, J. I. D.—Coal. Ext. Cumberland Presbyterian Quarterly Rev., April, 1883. From the author.

Dollo, M. L.—Note sur la Présence chez les oiseaux du "Troisième Trochanter" des Dinosauriens et sur la fonction de celui-ci. Ext. du Bull. du Mus. Roy. d'Hist. Nat. de Belg., 1883. From the author.

Green, Asa T.—Eureka, or the Golden Door Ajar. From the author.

Cassino, S. E. & Co.—Scientific and Literary Gossip.

Perot E. J. and Ulmer G. L.—The Amateur Naturalist. From the editors.

Ashburner, Chas. A.—Editorial Mining Herald and Colliery Guardian. Progress of the Second Geological Survey of the Anthracite Coal fields of Pennsylvania.

——Mapping the Anthracite Coal fields of Pennsylvania. Ext. Trans. Amer. Ins. Mining Engineers, 1881.

——The Anthracite Coal beds of Pennsylvania. Ext. Trans. Amer. Inst. Mining Engineers, 1882.

——Atlas of the Panther Creek Coal basin. Vol. I. Southern Coal field. All from the author.

Ryder, J. A.—Observations on the absorption of the yelk, the food, feeding and development of Embryo Fishes, comprising some investigations conducted at the Central Hatchery, Washington, D. C., in 1882. From the author.

——The microscopic sexual characteristics of the American, Portuguese and common edible oyster of Europe compared. From the author.

Martin, H. Newell, Sewall, H. T., Sedgwick, W. T. and Brooks, Wm. K.—Lectures delivered to the employes of the Baltimore and Ohio R. R. Co. From J. W. Garrett.

Hébert, Ed.—Gisement des conches marines de Sinceny (Aisne). Ext. Bull. Soc. Geol. de France, 1860.

——Sur la position des Sables de Sinceny. Ext. id. 1879.

——Mémoire sur le groupe Nummulitique du midi de la France. Ext. idem. 1882. All from the author.

Gatschet, Albert S.—Specimen of the Chumeto language. From the American Antiquarian, Vol. V, Nos. 1 and 2. From the author.

Lyman, B. Smith.—On the utility of the method of the Pennsylvania State Geological Survey in the anthracite field. Read before Amer. Inst. Min. Eng. Feb. 23, 1883. From the author.

Brewer, W. H.—The American trotting horse. Why he is and what he is. Board of Agriculture of Massachusetts, 1883. From the author.

——The evolution of the American trotting horse. Ext. Amer. Jour. of Science, 1883. From the author.

Yarrow, H. C.—Check-list of North American Reptilia and Batrachia, with catalogue of specimens in U. S. Nat. Museum. Bulletin U. S. Nat. Mus., No. 24. From the author.

Jordan, David S., and Gilbert, C. H.—Synopsis of the Fishes of North America. Bulletin No. 16, U. S. National Museum, 1883. From the department.

Foster, David.—The Scientific Angler. New York, Orange Judd & Co. From the publishers.

Dunker, Wilhelm, and Zittel, Karl A.—Palæontographica. Beiträge zur Naturgeschichte der Vorzeit. Vierte Lieferung. Cassel, 1883. From the authors.

Kerr, W. C.—The new map of North Carolina. From the author.

Marion, M. A. F.—Sur les Progres récents des Sciences naturelles. Discours prononcé le 5 Décembre, 1882, dans la Seance de Rentrée des Facultés de l'Academie d'Aix. 1883. From the author.

GENERAL NOTES.

GEOGRAPHY AND TRAVELS.[1]

ASIA.—Dr. L. E. Regel left Samar-land at the end of June last, and proceeded to Hissar by the very difficult though shortest route *via* Penja-kent, leading by the Fan river, Lake Iskander kul, and across the Mur pass. In the center of this region is a great mountain range, whose summits, the peaks of Kuli-kalan and the Chundar and Bodhan mountains, are seen from Samarkand. South of this range runs the Saridagh valley, and beyond this rises the Hissar range proper; while northward lie the Kul-i-kalan plateau, and the valleys of the Pasrut river and of a tributary of the Voron. The plateau of Kul-i-kalan is about thirteen miles in circumference, and has five lakes 10,000 feet above the sea level. The mountains around have no real glaciers, but old moraines are traceable. The rocks are fossiliferous limestones, and the vegetation of the region is richer than that of any other part of the basin of the Zarafshan. The forests are richest in the zone between 4000 and 8000 feet above the sea level, where the apple, cherry, nut and the Archa occur. The Archa also predominates in the upper zone, which reaches to a height of 10,500 to 11,000 feet—higher up than the line of perpetual snow—and has also birches, willows and an arborescent Ephedra. The Mur pass (14,000 ft.) is very steep, and immense accumulations of snow are found upon the southern slope, in the foggy climate of Hissar. A series of lower parallel ridges of fossiliferous sandstone occurs between the two main ranges and also betweenHakimi and Karatagh, while the mountains are syenite, syenite-gneiss, granite and fossiliferous slates.

Much valuable work has been done in the Caucasus and adjacent regions by the Caucasian branch of the Russian Geographical Society. The highlands of the Caucasus afford a greater variety of geological and physico-geographical features than the Alps, together with such a variety of botanical, zoölogical and ethnological features as can hardly be met with elsewhere, owing to their position between Europe, with its moist climate, highly-indented coasts and young civilizations, and Asia with its deserts and plateaux, dry climate and ancient civilizations. The longitudes and latitudes of Kars, Erzerum, Mysum and many other places have been correctly determined, and pendulum observations have shown that the geoid or true figure of the earth's surface nearly corresponds with the spheroid on the shores of the Black sea, but at Tiflis rises above it 1587 feet, and at Gudaur 4371 feet.

The Kars plateau is bordered by mountains reaching 9700 feet in height, devoid of wood and deeply cut by rivers. Migrations of various peoples are still going on, Armenians, Turks, Turco-

[1] This department is edited by W. N. LOCKINGTON, Philadelphia.

mans, Russians, Greeks, Kabards and Osets moving to and fro. The twelfth volume of the Memoirs contains the first part of a large work by the late General Uslar, on the ancient history of the Caucasus.

M. Nasiloff is spending a third year in the exploration of the Northern Ural. He has explored the River Lala under 59° N. lat., where he discovered layers of sphero-siderites; also the banks of the Sosva and the Lozva, along which he has made large geological, botanical and ethnographical collections.

The Batum province, the Santabago of antiquity, has a most luxuriant vegetation, but is thinly peopled. The mountains of the left bank of the Chorokh, between Batum and Artvin, are spurs of the Anti-Taurus, which terminates near the Chorokh in the peak Kvahid, 10,390 feet high. The deep gorges are occupied by Mussulman Gurians, and each is so isolated from the adjoining ones that the population has its own individuality. The fields of Indian corn and rice are often scratched on terraces 3000 feet above the sea, close to ruins of small old fortresses, each of which has its legend.

The small people called the Svanets, numbering only 12,000, seem to be degenerating in every way; goitre and cretinism are common. These diseases are also known in Western Daghestan and in the valleys of the Andian Koyson ridge. The men and women affected with a peculiar hysteric disease, bark like dogs, and the natives consider it as the result of bewitching with the "barking grass" (a kind of Orchis).

The province of Kars consists of three parts: the basin of the Olti, covered with clay hills and intersected by irrigation canals; the plateau of Kars, fifty miles long by thirty-five miles wide, and 5000 to 6000 feet high, and a plateau 6000 to 7000 feet high, covered with good pasture land and dotted with lakes.

AFRICA.—Lieut. Wissmann arrived at Cairo Jan. 1. His route from Loanda, by way of Nyangwe on the Lualaba, to Zanzibar, led him through the unexplored southern half of the Congo basin, which was found to be most densely populated.

The people called Tushilange, residing between the Kasai and the Lubi, are very numerous, and are ruled over by two chiefs, Kingenge and the more powerful Mukenge. Mukenge, with fifty of his wives, escorted the travelers to Nyangwe. The Munkamba lake, which had been described to the travelers as a vast sea, turned out to be only three miles long. It has apparently no outlet, and is 2230 feet above the sea. East of the Lubi dwell the Basonge, a very numerous people, of whom Lieut. Wissmann speaks as friendly, laborious and highly skilled in industrial art. He brought away splendid specimens of their weapons, carved ivory, inlaid wares and iron and copper utensils. Leaving the fertile plains inhabited by these tribes, the travelers

entered the vast virgin forests that extend to the Lubilash, a stream as wide as the Elbe. There are no fruit trees in these forests, and game and birds are therefore absent. Only elephants and a kind of wild boar were met with.

Some difficulty was experienced in crossing this stream owing to the ill-will of Kachichi, king of Koto, an old and much-reverenced sorcerer. Some shots and rockets finally frightened him into lending boats.

Beyond the Lubilash the territory of the Beneki was passed through. Of this tribe Lieut. Wissmann says that the villages are models, well built and clean, the houses surrounded by gardens and palm-trees. They are an agricultural people. Some of their villages are so long that it took three or four hours to pass through them.

Farther east they passed through the rich prairie lands inhabited by the Kalebue and Milebue, extending to the Lomami, another tributary of the Congo.

Another tribe visited was that of the Batuas, an undersized, slender, dirty and savage-looking people who subsist on the chase and on wild fruits, and whose arms and implements show a low state of culture. On the long and dangerous journey from Lake Tanganyika to Zanzibar, Lieut. Wissmann met with a most hospitable reception from the renowned brigand chief Mirambo.

He says that Lake Lincoln, reported by Dr. Livingstone, does not exist.

The mission station of Ribé, near Mombas, was recently visited by a marauding party of Wakwafi, a tribe through whose territory Mr. Thomson's expedition must pass. The tact of Mr. Wakefield averted a combat, which would have had a sinister effect on the prospects of the expedition.

Dr. Fischer, on the part of the French Geographical Society, has left Zanzibar for the interior, and intends to visit the unfriendly Masai as well as to explore the country between Lakes Manyara and Naivasha.

M. Storms arrived at Karema on the 27th September last, having left the coast on June 9th, thus making the journey in the unparalleled short time of three months and a half.

Monseigneur Fr. Sogaro, papal vicar of Central Africa, from Sahara to the equator, has left for Khartum.

M. l'Abbe Guyot has ascertained that the Ruaha, or Lufigi, the river that issues from the great lakes and empties itself into the sea below Zanzibar, is not navigable. It is a beautiful, broad watercourse in some parts, but narrower in others, and full of islets and rocks. Père Guyot spent seventy-two days in the district, and is preparing a map of it.

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Monseigneur Fr. Sogaro, papal vicar of Central Africa, from Sahara to the equator, has left for Khartum.

M. l'Abbe Guyot has ascertained that the Ruaha, or Lufigi, the river that issues from the great lakes and empties itself into the sea below Zanzibar, is not navigable. It is a beautiful, broad watercourse in some parts, but narrower in others, and full of islets and rocks. Père Guyot spent seventy-two days in the district, and is preparing a map of it.

GEOGRAPHICAL NOTES.—M. Yavorski is publishing the account of his journey to Cabul. He passed by the once famous town of Bamian, now in ruins.——The Argentine expedition sent in search of the murdered Crevaux has explored a portion of the course of the Pilcomayo.——The (French) Society of Historical Studies has offered a prize of 1000 francs for the best essay upon "The effects, from an economist's point of view, of the cutting of the Isthmus of Panama on the relations of Europe with countries washed by the Pacific ocean."——Two new meteorological stations have been established in the north of Russia, east and west of the Ural chain, at Mesena (Europe) and Berezov (Asia). As these are removed entirely from the influence of the Gulf Stream, and are in the track of the cold, dry winds that from time to time sweep over Europe, they will prove important.——The Yellow river has not resumed its southern course, and only flows with recurring floods in its old bed.——Some of the members of the Crevaux mission are stated to be still alive and dwelling as slaves among the Tobas, who are being instructed by them in the use of arms.——Baron Nordenskiöld has claimed from the Dutch Government the reward of 25,000 guilders (about $10,000) offered by the Dutch three centuries ago to the discoverer of the Northeast passage. The Dutch press considers the demand legitimate and just.——A new orographical map of Asia Minor and the surrounding countries, based on measurements of heights of 1500 places, has been exhibited by Gen. Stebnitsky to the Caucasian Geographical Society.——M. Polakoff, who was sent to explore Sakhalin island and the Pacific coast of Asiatic Russia, and who spent last winter and spring at Taranka in the Gulf of Patience, has returned to Korsakovo with rich scientific collections. He will now begin the exploration of the coasts of Russian Manchuria.——The French expedition to the Niger has reached the banks of that river, after a battle with the chief of Daba, who was killed with a large number of his followers.—— The Danish ministry received on February 24 a despatch from St. Petersburg stating that the Samoyedes sent out to look for the *Dijmphna* and *Varna* had neither seen any vessel nor heard of any shipwrecked crew.——The province of Ferghana, in Turkistan, contains no less than than 200 naphtha wells at the foot of both mountain ridges that enclose the valley of Ferghana. The product of the wells, which are in the limestones and slates of the chalk formation, is a heavy mineral oil, which, after the evaporation of the naphtha, leaves a heavier "*khlik*" that gives an excellent water-proof cement when mixed with sand. There are also mines of mountain-wax on the Kok-tube mountain, and a sulphur mine at Karim-duvany.——Baron Nordenskiöld maintains that the constant advance of the ice-mass in Greenland, as well as the fact that the country does not rise continually in the interior, show that the whole land is not covered with snow and

ice; and the studies made by him and others upon the temperature and moisture of the air on the inland ice corroborate this conclusion. His expedition started in May. A Danish expedition will also be sent to the east coast of Greenland.——The death of Dr. Kayser, who had been sent by the German African Society to their station on the shores of Lake Tanganyika, is announced in a communication from Zanzibar, dated Nov. 8, 1882. ——The Lena meteorological station is situated in 73° 22′ 30″ N. lat., and 126° 34′ 55″ E. long. The health of the expedition is satisfactory.

GEOLOGY AND PALÆONTOLOGY.

THE DECAY OF ROCKS GEOLOGICALLY CONSIDERED.[1] — The author in this paper presented, in a connected form, the principal facts in the history of the decay both of crystalline silicated rocks and of limestone or carbonated rocks by atmospheric agencies. Having first discussed the chemistry of the process, he noticed the production of spheroidol masses or so-called boulders of decomposition by the decay and exfoliation of massive rocks. He then proceeded to show that the process of decay is not, as some have supposed, a rapid or a local one, dependent on modern conditions of climate, but that, on the contrary, it is universal and of great antiquity, going back into very early geological periods. These conclusions were supported by details of many observations among Palæozoic stratified and eruptive rocks in the St. Lawrence valley, as well as among Eozoic rocks in the Atlantic belt, as seen in Hoosac mountain, in the South mountain and in the Blue Ridge. In connection with the latter he described the decay not only of the crystalline strata but of their enclosed masses of pyritous ores and the attendant phenomena.

The decay of the primal and auroral strata of the Appalachian valley, and the formation therein of clays and of iron and manganese-oxyds was also discussed. The Pre-cambrian antiquity of the process of decay in the Eozoic rocks in the Mississippi valley, as shown by Pumpelly and by Irving, was noted, as well as similar evidence from Europe; while the more recent decomposition seen in the Pliocene auriferous gravels in California was described and explained.

The final removal of the covering of decayed rock from many northern regions during the drift period was then considered, and the thesis advanced by the writer in 1873, that the decomposition of rocks "is an indispensable preliminary to glacial action and erosion, which removed previously softened materials," was discussed in its relation to boulders, glacial drift and the contours of glaciated regions. Pumpelly's development and extension of this doctrine of wind erosion, was noticed, and also the recent

[1] Abstract of paper by T. Sterry Hunt, LL.D., F.R.S., read before the National Academy of Sciences, at Washington, April 17, 1883.

comparative studies of Reusch in Norway and in Corsica, in which similar views are enforced.

The principal points in the paper are resumed at its close, as follows:

I. The evidence afforded by recent geological studies in America and elsewhere, of the universality and the antiquity of the subaërial decay both of crystalline silicated rocks and of calcareous rocks, and of its great extent in Pre-cambrian times.

II. The fact that the materials resulting from such decay are preserved *in situ* in regions where they have been protected from denudation by overlying strata, alike of Cambrian and of more recent periods; or, in the absence of these, by the position of the decayed rock with reference to denuding agents, as in driftless regions, or in places sheltered from erosion, as within the St. Lawrence and Appalachian valleys.

III. That this process of decay, though continuous through later geological ages, has, under ordinary conditions, been insignificant in amount since the glacial period, for the reason that the time which has since elapsed is small when compared with previous periods, and also probably on account of changed atmospheric conditions in the later time.

IV. That this process of decay has furnished the material not only for the clays, sands and iron-oxyds from the beginning of Palæozoic time to the present, but also for the corresponding rocks of Eozoic time, which have been formed from the older rocks by the more or less complete loss of protoxyd bases. The bases thus separated from crystalline silicated rocks have been the source, directly or indirectly, of all limestones and carbonated rocks, and have, moreover, caused profound secular changes in the composition of the ocean's waters. The decomposition of sulphuretted ores in the Eozoic rocks has given rise to oxydized iron ores *in situ*, and to rich copper deposits in various geological periods.

V. That the rounded masses of crystalline rocks left in the process of decay, constitute not only the boulders of the drift, but, judging from analogy, the similar masses in conglomerates of various ages, going back to Eozoic times, and that not only the forms of such detached mass, but the surface-outlines of eroded regions of crystalline rocks were determined by the preceding process of subaërial decay of these rocks.

GEOLOGY OF THE CHESTER VALLEY OF PENNSYLVANIA.—The following note from Mr. Chas. Hall further criticizes the article of Mr. Rand, which was the subject of a review by Professor Frazer in the May number of the NATURALIST:

I am unfortunately situated to make a reply to Mr. Rand's paper which appeared in the Proceedings of the Mineralogical and Geological Section of the Academy of Natural Sciences, inasmuch as I have none of my notes or even a copy of the paper

to which he refers. I can with propriety, however, make a few comments here on his argument.

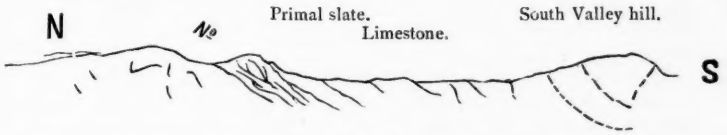
In the first place Mr. Rand does not account for the absence of slates, corresponding to the South Valley Hill belt (hydromica slate), on the north side of the Potsdam sandstone of the North Valley hill.

The Potsdam of the North Valley hill, in the vicinity of the Schuylkill river and the sandstone east of the river, rests directly upon a series of syenites, hornblendic and quartzoic rocks which correspond in age to the rocks of the Reading and Durham hills in Lehigh and Northampton counties (Laurentian).

Mr. Rand quotes a statement of mine that the "hydromica schists * * * are the Hudson River shales and flank the Chester valley on the south."

The quotation does not convey the fact that I argued that the limestones of the Chester valley rested upon decomposed feruginous slates with limonite ore and Potsdam sandstone.

The decomposed slates are without doubt the upper primal of Professor Rogers.



Along the southern margin of the limestone in the district under consideration (vicinity of the Schuylkill river) the limestones pass by gradual alternations into slates (hydromica slates of the South Valley hill).

The character of the limestone is very different along the south side of the valley from that on the north.

Along the northern side of the valley there is nothing to be seen of a transition from the the upper primal slates into the limestone of No. II.

Adjoining the alternations of limestone and slate along the southern margin of the Chester valley *there is no regular deposit of sandstone or quartzite in any portion of the district where I have worked.*

The limestones along the northern edge of the Chester valley are usually more or less of a light drab color, and decidedly dolomitic, while on the southern side of the valley they are usually of a bluish cast and associated with white and blue marble. The marble is always confined to the southern side of the valley.

As a further argument in favor of the superposition of the hydromica schists of the South Valley hill, I considered the synclinal structure of the north-eastern point of the South Valley hill just north of Gulf mill and the synclinal structure of the Gulf Mill escarpment.

In the face of these and many other facts, I concluded that the South Valley Hill slates must belong to a more recent age than the limestones, and as there is a gradual transition from the limestones into these slates, similar to that found in other portions of the State, they must be of Hudson River age.

I have never observed any deposits of sandstone, of consequence, within the South Valley Hill belt, and none at all between the slates of the South Valley hill and the limestones.

Limonite ore does occur close to the junction of these slates and the limestone, at a point just north of Gulf mill and also south of the South Valley hill just west of West Conshohocken.

That deposit north of Gulf mill is intimately associated with the slates of the South Valley hill, but is very different from those in proximity to the Potsdam on the north side of the valley.

Without going further into details, I would say that Frazer's views and mine are at variance. He finds, I believe, rocks below (underlying) the Potsdam sandstone and interposed between it and the underlying syenitic rocks.

Our observations along the junction of the South Valley Hill slates and the limestones do not agree, and upon these two points depends the structure of the succeeding measures south of the valley.

Unfortunately Mr. Rand has apparently taken the tangled skein in hand and has begun in the middle to unravel a snarl which can only be accomplished by careful observation and comparison extending over a much larger area than a single township.—*Chas. E. Hall, Grove Hill, Page Co., Va., April 3, '83.*

ANNUAL REPORT OF THE STATE GEOLOGIST OF NEW JERSEY FOR 1882.[1]—This little volume is brimful of information respecting the neighbor State, contains a complete geological map; two smaller maps, one illustrating the geodetic survey, the other the watersheds of the State; and six lithographs of prominent geological features. The topographical survey was engaged in 1882 upon 430 square miles of rugged highland, and in the Bearfort district three beautiful little lakes were mapped for the first time, and two others correctly located.

The red sandstone, or Triassic, occupies a broad belt crossing the State obliquely, and containing 1507 square miles. It is a plain shut in on the north and north-west by the Highlands, and open to the south and south-east toward the Cretaceous and newer deposits. This area contains, beside the sandstone proper and red shales, siliceous and calcareous conglomerates, limestones and trap rocks. As very nearly half the belt is north of the terminal moraine, these rocks are, to a great extent, concealed by glacial drift and alluvial beds deposited in basins formed by

[1] Annual Report of the State Geologist for the year 1882. Camden, N. J. F. F. Patterson.

glacial moraines. The shales vary in hardness from that of scarcely compacted clay to argillaceous sandstone, and some of the sandstone is argillaceous and liable to fall to pieces on exposure to atmospheric agencies.

The report gives valuable information respecting the iron mines, the output of which last year was 900,000 tons, or more than in any previous year; the plastic clays, with their industry of brick-making, terra-cotta and terra-cotta lumber (a mixture of sawdust and clay, forming a light yet strong building material); the changes of the shore line, the net result of which is considerably in favor of old ocean, who has encroached upon the meadow sod so that in some spots tracks of cattle and horses are found on what is now the beach; and upon seaside developments, climate, and the rapid progress of agriculture in the southern and almost sub-tropical extremity of the State.

THE TIDES ON THE BAY OF FUNDY.—Referring to the article in your paper of December 9, 1882, headed "Blomidon": These high tides, and the still higher stories we often hear of them, having perplexed me from youth, I set out last summer to study their reputed phenomena, before venturing to take a party of my friends in the steam yacht. The following course was sailed over: From this city to Halifax, N. S., standing well out to sea; thence coastwise to Cape Sable and Yarmouth; across the inner mouth of the bay to Grand Manan island; up the coast of New Brunswick to St. John and Truro, at the head of the bay; down the coast of Nova Scotia to Annapolis, which river and several others I ascended, thus circumnavigating the entire sheet of water, which is about 180 miles long by an average width of 40 miles. Soundings and deep sea and surface temperatures were taken during the cruise. A week was spent at Kingsfort, N. S., on the beautiful Basin of Minas, a few miles from Cape Blomidon and Cape Split.

These tides are, as you say, one of the wonders of the world. They are caused, as are also the dense fogs of this region and of the North Atlantic by the cold Gulf Stream,[1] pouring from the Arctic ocean by Smith sound, Baffin's bay and Davis strait, along the coast of Labrador, and through the Strait of Belleisle, which discharges into the Gulf of St. Lawrence. These cold, heavy currents hug the coast line as they run.

On doubling the south-east corner of Nova Scotia, at Cape Sable, they strike for the first time the warm and lighter waters from the south, and drive the latter before them toward the point of least resistance, which is up the Bay of Fundy. At its mouth, opposite Cape Sable, the tide rises 6 feet; opposite Digby, 28 feet; at St. John, 38 feet; off Windsor, 45 feet, and when ebb, a bucket could not be filled with water in the harbor; at Truro, 60 feet, and at ebb the red clay bottom is exposed for a distance of

[1] This is a mistake. Labrador current is undoubtedly meant.—*Eds.*

twenty-five miles. These measurements refer to spring tides, which are highest. But the belief which so generally prevails, that the tide assumes, as it rushes onward with loud roar and great velocity, a high, almost vertical wave, or "bore," as it is termed, which even draws into its vortex such animals as may stray near the beach, is wholly erroneous. *There is no bore or tidal wave on the Bay of Fundy.* Navigation there is neither dangerous nor difficult, unless it be from fog or ice. In the absence of storms, the tides, ebb and flood, are accompanied by scarcely a ripple. Even at Cape Split, where the bay suddenly contracts to a width of about three and a-half miles, the "wave" *will not measure one inch in height.* What can have been the origin of this fable, which has not only obtained general credence among many, but is even accepted by men of science without question, and is yet chimerical as a madman's dream? Probably the very trifling bore which does really exist on two small tributaries of the bay, the Petitcodiac and Shubenacadie. The bore on the former river I measured at Moncton, N. B., eighty-nine miles E.N.E. of St. John, and found it just three and a-half feet high, with a travel up-stream of six miles per hour. It is caused by the last of the ebb tides being met and repelled by the flood tide in a narrow stream confined by almost vertical banks.—*P. F. McCourt, M. D., in Scientific American.*

A NEW IGUANODON.[1]—M. L. Dollo, of the Belgium Museum of Natural History, has carefully examined fifteen out of the twenty-two dinosaurs that have been found at Bernissart, and confirms the conclusion of M. G. A. Boulenger, who (Sur l'arc pelvien chez les Dinosauriens, Bull. de L'Acad. Roy. de Belg., 1881) recognized among them a new species of Iguanodon, to which he gave the name of *I. bernissartensis.* This new form is much larger than the well-known *I. mantelli,* the bones of which occur in company with it, as it attains a length of ten meters. It is also more massive in all its proportions, the fore limbs are longer compared with the hinder pair, the sacrum is formed of six vertebræ instead of five, and there are numerous other differences, too important to be individual or sexual in their nature. As in all the examples the cranial sutures are obliterated, it is certain that the larger form cannot be the adult of the smaller.

M. Dollo distinguishes three good species of Iguanodon, *I. prestwichii,* with four sacral vertebræ, *I. mantelli,* with five, and *I. bernissartensis,* with six. *I. seeleyi,* described by Professor Hulke in 1882, is thought to be identical with *I. bernissartensis,* but the question is not settled. The sternum in all the examples is well ossified.

GEOLOGICAL NEWS—*Post-tertiary.*—A deposit of mammalian remains of the diluvial period has been laid bare by the Wolga

[1] Sur les Dinosauriens de Bernissart. Par M. L. Dollo. Ext. du Bulletin du Musée Royal de Belgique. Tome 1, 1882.

on its banks, between Zarizyn and Sarepta. *Elephas primigenius*, *Bos priscus*, Elasmotherium, *Camelus knoblochi* and several antelopes, stags, etc., are among the contents.——Remains of animals, the bones of which have apparently been broken by man, together with many stone implements, have been found in the crevices between the blocks of lava underlying a pumicestone pit near Andernach, on the Rhine. As the pumicestone filled the crevices to a depth of two or three feet, and the bones, etc., were beneath this filling-in, it is believed that there was a settlement on the spot, the food-remains from which fell into the crevices *before* the deposition of the pumicestone.——On the Middle Ural M. Malakhoff has explored the lake dwellings of the neighborhood of Ekaterinburg, and has discovered close by Irbit, very interesting accumulations of bones, lake dwellings on Lake Ayat, and stone and bone implements in a cavern close to the Mias ironworks.

MINERALOGY.[1]

NEW MINERALS.—I. *Jéréméiéwite* is a new mineral discovered by M. Jéréméiew in Southeastern Siberia, and named after him by Damour.[2] It occurs crystallized in regular hexagonal prisms, transparent and nearly colorless. Its hardness = 6.5; specific gravity 3.28. It has a vitreous fracture and is without cleavage. At first sight it resembles beryl, tourmaline or apatite.

Before the blowpipe it loses its transparency, blanches, and gives to the flame the green color characteristic of boric acid. It is with difficulty attacked by acids. With cobaltic nitrate, after heating, it takes a fine blue color.

It is essentially a borate of alumina with a small proportion of iron. A mean of three analyses gave:

B_2O_3	Al_2O_3	Fe_2O_3	K_2O		
40.19	55.03	4.08	0.70	=	100.

yielding the formula $(Al_2O_3, Fe_2O_3)\ BO_3$.

II. *Picro-epidote* is a name proposed by Damour to designate a variety of epidote from Lake Baikal, Siberia, which has magnesia as a base and is infusible. It occurs in white or yellowish-white small crystals in lapis lazuli. Des Cloiseaux has shown that the crystallographic and optical characters are those of epidote.

III. *Dumreicherite* is a new mineral of the alum group described by Dr. C. Doelter[3] as occurring in crevices in lava in the form of superficial crusts. It was apparently monoclinic, but had a

[1] Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.

[2] Bulletin Soc. Min. de France, T. VI, p. 20, April, 1883.

[3] Zur Kenntniss der vulcanischen Gest. u. Min. d. Capverd'schen Inseln.

fibrous structure. It is readily soluble in water, and has an astringent taste. Its composition, according to Kertscher, is:

SO_3	Al_2O_3	MgO	H_2O	NaCl	
36.65	7.14	11.61	45.01	tr.	= 100.41.

giving the calculated formula $4\ MgSO_4 + Al_2S_3O_{12} + 36$ aq.

RECENT LITHOLOGICAL WORK.—It is daily becoming more evident that a classification of rocks either by their chemical composition alone or by the minerals they contain, is artificial and unsatisfactory, and that a true basis of classification is to be found only by combining the general characters of rocks with their mode of occurrence as elucidated by field work. Lithologists are finding that the microscope and the laboratory are not all-sufficient, but that observation of the geological relations of the rocks is of the first necessity. Lithology thus rises to a higher sphere, and not content with giving a multitude of names to rocks of varying texture and in different stages of decomposition, is becoming one of the most important methods of geological research.

Perhaps no one is striving more earnestly toward the establishment of this broader method of lithological work than Dr. M. E. Wadsworth, of Cambridge. In a forthcoming work to be published by the Museum of Comparative Zoölogy, he dwells upon the importance of grouping the characters of rocks, rather than taking any one character as a basis of classification, and compares the usually received classifications with the Linnean artificial botanical classification.

In the same essay certain conclusions are reached which are of much interest, and are often widely at variance with generally received theories. He holds that the interior of the earth is now liquid, that eruptive, volcanic and plutonic rocks are derived from original liquefied material, not from sedimentary deposits, and that our crystalline rocks are the result of the metamorphism of eruptive rocks rather than of sedimentary rocks. He holds that meteorites and the recent volcanic rocks are the only rocks which have not been altered, and makes them his basis of classification. He seems to hold that even the gneisses have been altered from eruptive, volcanic rocks. Meteorites are regarded as having been derived from a hot, liquid mass, rather than from a gaseous or solid body, and it is suggested that they may have come from the sun. The appearance of the memoir in full is awaited with interest.

CHARCOAL AS A PRECIPITANT FOR GOLD.—Mr. Wm. Morris Davis[1] (Sr.) has discovered a novel and most interesting method for separating gold from its solution by employing charcoal. He has found that charcoal has a remarkable energy in causing the

[1] Journ. Franklin Inst., April, 1883.

precipitation of gold from its chlorine solution, while other metallic and mineral constituents of the same solution are unaffected. The gold is thus both deposited and refined. All that is necessary is to pass the solution of the gold ore through a charcoal filter, when the gold in a pure state is deposited upon the charcoal, which may then be burned and a button of gold readily obtained.

This discovery, so simple in its method, was at first ridiculed by chemists. Repeated experiments have, however, shown its efficacy. Not only are no other substances than gold thus deposited, but the gold itself is completely separated from its terchloride solution, the liquid after having passed through the charcoal containing not even a trace of gold. As copper is not affected by the passage through the charcoal filter, that metal may be afterwards deposited by contact with scrap-iron. Silver would already have been precipitated as chloride in the original solution. By this process, therefore, gold, silver and copper may each be separated by most inexpensive methods from the same solution.

The explanation of the remarkable property of charcoal here described, lies in the fact that, as shown by experiment, it has the property of converting chlorine into hydrochloric acid. It oxidizes at the expense of the water, and liberates hydrogen, which unites with the chlorine. It follows, therefore, that the gold is deposited, not from any affinity for carbon, but simply because the chlorine in which it was soluble has been taken away to form hydrochloric acid, in which gold is insoluble. It also follows that copper and other metals soluble in hydrochloric acid are not affected by the conversion.

Crystallized Serpentine from Delaware.—Professor H. C. Lewis[1] has described certain crystals of serpentine which occur in the deweylite of Way's quarry, Delaware. The deweylite contains angular fragments of quartz, such as would be produced by throwing a heated quartz crystal into cold water. It also contains rounded masses of feldspar which are more or less altered into deweylite. The deweylite is thus shown to be probably the result of the alteration of graphic granite.

The crystals of serpentine, of a smoky pearl color, have a micaceous cleavage, and in the polariscope are shown to be biaxial with a small optic-axial divergence. The physical and chemical characters, including an analysis by Mr. Haines, are given, and the mineral is proved to be a true serpentine. The cleavage and the optical characters show that it is crystallized.

The Fluorine Minerals.—In an extended review of the fluorine minerals, by Professor P. Groth,[2] our knowledge of these

[1] Proc. Acad. Nat. Sci. Phila., Feb., 1883.
[2] Zeitschr. f. Kryst., etc., VII, 4th and 5th Nos.

minerals is rendered much more exact. He treats with especial detail the cryolite group of minerals. *Cryolite* is shown to be monoclinic instead of triclinic. *Pachnolite* and *thomsenolite* are shown to be species distinct from each other, the latter mineral containing one molecule of water, as already proved by Brandl.[1] The crystals of pachnolite are monoclinic, having generally the form of slender prisms, the prisms being striated horizontally. Thomsenolite has the same characters, both minerals decrepitating strongly when heated. Ralstonite, an isometric mineral, and chiolite, a tetragonal mineral resembling cryolite, have been re-examined and Brandl gives them new formulæ. Arksutite is shown to be merely a mixture of cryolite and pachnolite, and not a distinct species.

A NORWEGIAN DUST SHOWER.--On the 26th of last February a fine dust was discovered overlying the snow in Trondhjem Amt (district of Drontheim), in Norway, and like the dust showers which followed the volcanic outbreak of 1876, was thought to indicate a recent volcanic eruption in Iceland. Dr. Reusch, of the mineralogical faculty of the University of Christiania, has, however, shown that it is not of eruptive origin, but consists of common sand, fine particles of quartz, hornblende and talc and some associated fine particles of vegetable matter. Although the volcanic origin of this dust has been disproved, it is nevertheless of interest, considering the wide extent of snow-covered country over which this dust was deposited.

MICROLITE FROM ELBA.—A. Corsi[2] has found small crystals of microlite at several localities in Elba. It occurs in granitic rocks and is associated with albite, orthoclase, tourmaline, lepidolite, etc. The principal forms are octahedra and rhombic dodecahedra. In color it varies at different localities from dark, dirty green to yellow, and from being opaque to translucent, the transmitted light being reddish-yellow. The powder is grayish-white. The other characters are those usual to microlite.

AMELIA COUNTY, VA., MINERALS.—Professor W. F. Fontaine[3] contributes an interesting article upon the minerals of Amelia Co., Va., giving much information not heretofore published. The microlite and monazite, columbite, fluorite, beryl, orthite, helvite, etc., are each described in detail. In the description of helvite, which includes Mr. Sloan's analysis, Professor Fontaine omits to make any mention of the original discovery of that mineral by Professor Lewis.

THE WM. S. VAUX COLLECTION.—This magnificent collection of minerals and archæological specimens, bequeathed under certain

[1] AMER. NATURALIST for Jan., 1883, p. 76.
[2] Boll. R. Com. Geologico, 1881. 564.
[3] *Am. Jour. Sc. and Arts*, May, 1883.

conditions to the Philadelphia Academy of Natural Sciences, has finally been received by that institution. There are over six thousand trays of minerals in the collection, having an aggregate value of $40,000. Many of the specimens are of rare beauty and perfection, some of them being unique in those respects. The collection, the result of a lifetime's labor of love, represents the inorganic world in its most beautiful garb, and incites a higher appreciation of nature's handiwork. The academy has made alterations in its building so as to secure special rooms for the collection, over which a special curator is also to be appointed. The conditions of the gift are such as to surround the collection with every safeguard against depredation.

The archæological collection is estimated to be worth at least $10,000. It includes suites of specimens from almost all parts of the world, and is especially rich in relics of the Swiss lake dwellers, in pottery and implements of the American mound-builders, and in vases and idols from Mexico and Peru.

The sum of $11,000 is also given to be applied to the fitting up of cases, to the care of the collections and to the purchase of specimens and books.

BOTANY.[1]

NEW WESTERN GRASSES.—No full revision of North American grasses has been attempted in many years. The writer has been a careful student of the order, and has, during the past ten years, been accumulating material for its thorough investigation.

During the past three or four years many large collections of Western grasses, made by Howell and Henderson in Oregon, Suksdorf in Washington Terr., Parish, Cleveland and Lemmon in California and Arizona, G. R. Vasey in Arizona and New Mexico, Jones in Utah and California, Reverchon and Havard in Texas and Arkansas, Wolf in Illinois, and Gattinger in Tennessee, have been in my hands; and as the result several new species have been already published and a number of others are identified and will be described and published at an early day.

Professor Scribner, of Philadelphia, has also during the past few years been carefully studying the order, having been provided with the material of several collectors. We have freely consulted together, and tried to arrive at clear results, and it is our purpose jointly to publish as soon as possible a catalogue as full and complete as our material will permit.

Toward the furtherance of this object we would be glad of the assistance of all botanists and collectors in the communication of specimens and notes which may render our labors as effective as possible.

The following list indicates some unpublished species, most of which are based upon recent collections, a few, however, having

[1] Edited by PROF. C. E. BESSEY, Ames, Iowa.

been several years in herbarium, and a few being modifications or changes of names for previously published species:

1. *Panicum autumnale* var. *pubiflorum.*
2. *Tripsacum lemmoni.*
3. *Aristida falmeri.*
4. *Stipa stricta.*
5. *Muhlenbergia wrightii.*
6. *Sporobolus wolfii* (*Vilfa minima*).
7. *Sporobolus interruptus.*
8. *Agrostis foliosa.*
9. *Agrostis exarata* var. *littorale.*
10. *Trisetum montanum.*
11. *Graphephorum wolfii* (*Trisetum wolfii*)
12. *Danthonia intermedia.*
13. *Bouteloua havardii.*
14. *Bouteloua pusilla.*
15. *Eragrostis neo-mexicana.*
16. *Poa kelloggii.*
17. *Poa flexuosa* var. *occidentalis.*
18. *Poa alsodes* var. *occidentalis.*
19. *Poa stenantha* var. *brevifolia.*
20. *Poa wardii.*
21. *Poa elongata.*
22. *Poa nevadensis.*
23. *Poa gracilis.*
24. *Glyceria lemmoni* (*Poa lemmoni*).
25. *Festuca jonesii.*
26. *Bouteloua burkii* F. L. S.
27. *Deyeuxia tweedii* F. L. S.
28. *Melica fruticosa* F. L. S.
29. *Muhlenbergia dumosa* F. L. S.

—*George Vasey, Depart. of Agric., Washington, D. C., March 6.*

MEMORANDUM AS TO THE COMPASS PLANT.—My correspondent, Rev. Dr. Thomas Hill, LL.D., formerly president of Harvard, now at Portland, Maine, thinks the stages of growth of the seedling of the compass plant (*Silphium laciniatum*) should have accurate and repeated observations, and a report of the direction of the young leaf at various dates. He made such observations in 1870, and reported them to the Troy meeting of the Am. Ass. for Adv. of Science in August, 1870 (see page 285 of Proceedings). He writes me that the drought of that summer was unfavorable, and wishes that such experiments could be tried again and minutely observed and reported. He planted in north and south rows, but (not trusting that) he says, "over the seed bed I stretched as soon as I had planted the seeds, some white cotton threads, as exactly in north and south direction as I could. Then I had simply to measure by a paper protractor the angle made by the young leaves with the threads. They should grow into rich, damp ground and be fairly exposed to light on all sides. Measure at the end of each week, keeping a record—a table." He says, "they began to turn towards the meridian when about four inches high, twisting the petioles in the whole length as they do so."

In his letter he makes a diagram, grouping together what were their directions at different dates; when very young pointing in *all* directions, but as they grew passing nearer and nearer to the meridian.—*Benjamin Alvord, Washington, D. C.*

CLASSIFICATION OF THE UREDINES.—Mr. C. B. Plowright has been studying the British plants of this group—the rusts, as they are familiarly called—and has embodied the results in a paper

published in *Grevillea* for March, 1883. The British species are arranged under nine genera, as follows:

Uromyces, with twenty-three species. Five tribes are recognized, viz: 1. Lepturomyces; 2. Micruromyces, in both of which teleutospores only occur; 3. Hemiuromyces, with uredo and teleutospores; 4. Uromycopsis, with æcidia and teleutospores; 5. Euromyces, with æcidia, uredo and teleutospores. The last is again subdivided into (1) species with all three spore forms on the same host plant, and (2) those with æcidia on one host and uredo and teleutospores on another.

Puccinia, with sixty-six species. Five tribes are recognized here also, viz: 1. Leptopuccinia; 2. Micropuccinia, both with teleutospores only; 3. Hemipuccinia, with uredo and teleutospores; 4. Pucciniopsis, with æcidia and teleutospores; 5. Eupuccinia, with æcidia, uredo and teleutospores. This tribe is divided into two sub-tribes as in Uromyces. The heterœcismal species are *P. graminis* of wheat and various grasses, with æcidia and on barberry; *P. rubigo-vera* of barley and various grasses (and wheat in this country), with æcidia on Lycopsis, Echium and Symphytum; *P. coronata* of various grasses (oats in this country) with æcidia on Rhamnus; *P. moliniæ* of Molinia, with æcidia on Orchis; *P. poarum* of Poa, æcidia on Tussilago; *P. magnusiana* of Phragmites, æcidia on Rumex; *P. sessilis* of Phalaris, æcidia on Allium; *P. caricis* of various Carices, æcidia on Urtica; *P. sylvatica* of a Carex, æcidia on Taraxacum.

Gymnosporangium, with three heterœcismal species.

Triphragmidium, with a single species.

Phragmidium, with six species, in two tribes, viz: (1) Phragmidiopsis, with æcidia and teleutospores, and (2) Euphragmidium, with æcidia, uredo and teleutospores.

Cronartium, with a single species.

Melampsora, with twelve species. Four tribes are recognized, viz: 1. Micromelampsora, with teleutospores only; 2. Hemimelampsora, having uredo and teleutospores; 3. Melampsoropsis, having æcidia and teleutospores; 4. Eumelampsora with æcidia, uredo and teleutospores. This last includes but one species, *M. populina*, the rust of poplar trees (Populus) the æcidia of which occur on Clematis.

Coleosporium, with four species, forming two tribes: (1) Hemicoleosporium having only uredo and teleutospores, and (2) Eucoleosporium having æcidia, uredo and teleutospores. Under the latter we find *C. senecionis* of various species of Senecio, the æcidia, however, occurring on Scotch pine, and hitherto known under the name of *Peridermium pini*.

Endophyllum, with two species.

Some æcidia and uredo forms have not yet had their affinities made out; these in Mr. Plowright's paper are simply catalogued in an appendix, and await further study.

A NOTE ON TRADESCANTIA VIRGINICA.—Last summer I had an opportunity of observing many plants of the common spiderwort under cultivation. Two variations in the structure of the flowers were quite frequent. One was in their numerical plan, some being *dimerous* and a very few *tetramerous*. Another much more interesting variation was the transformation of stamens into petals, which throws some clear light on the morphology of the stamen. There were numerous instances illustrating this and furnishing all sorts of gradations. Some of the more important and conspicuous were the following: *First*, a fusion of the hairs on one side of the filament into a half petal, while the rest of the stamen was of the normal form; *second*, a similar fusion of the hairs on *both* sides of the filament, the anthers remaining, if not perfect, at least as yellow thickened pads at the bottom of a deep apical notch; and *third*, a petal deeply notched with purple callosities at the bottom of the notch, as though its apical portion had been arrested in its longitudinal growth and had simply increased in thickness instead. In some cases this thickened portion was elongated and partly detached from the petaloid portion. All of which goes to show:

1. The hairs on the filaments are modified portions of the blade of a petal, and therefore portions of the *phyllome*, rather than *trichome*.

2. The anthers, in this plant at least, are to be regarded as modified portions of the petal rather than outgrowths from it.—*J. E. Todd, Beloit, Wis.*

INFLUENCE OF MOONLIGHT UPON PLANTS.—M. Musset read a paper before the Paris Academy of Sciences, at its session March 5, 1883, upon the influence which the light of the moon has upon the direction of plant growth. "Plants of phototropic sensibility were grown from seeds in pots in a very dark place; then on three nights exposed at a window to direct moonlight; the stems bent over towards the moon and followed it in its course."

REMARKABLE FALL OF PINE POLLEN.—On the 18th of April of the present year, in gathering some water plants (Zygnemaceæ, Saprolegniaceæ, etc.) from a prairie pond in Central Iowa, I noticed an abundance of what turned out to be pine pollen on the surface of the water. Now there are no native pines in this part of the State, the only pines being those planted for ornamental purposes. None of these, however were in bloom, neither were the pine forests of Minnesota, Wisconsin, Michigan and northward. For some days prior to the finding of the pollen, strong south-easterly, south-westerly and westerly winds had prevailed. Doubtless these brought the pollen, but how far it was carried cannot at present be made out. However it is certain that the distance could not have been less than three or four hundred miles.—*C. E. Bessey.*

SIMILARITY OF PLANT AND ANIMAL CELLS.—In a paper on plant cells and living matter, by Dr. L. Elsberg, in the *Quarterly Journal of Microscopical Science* for January, the author concludes that the frame of cellulose, analogously to the cement substance of animal epithelia and the basis substance of other animal tissues, is pierced by either single filaments of living matter or a reticulum with more or less large accumulations of living matter, interconnecting all neighboring tissue elements, and that the plant, therefore, like the animal, is one continuous mass of living matter, with interspaces which contain some non-living material.

BOTANICAL NOTES.—A. P. Morgan publishes, in the Journal of the Cincinnati Society of Natural History (April, 1883) a valuable paper on "The Mycologic Flora of the Miami valley, Ohio." Descriptions are given of eighty species of white spored Agarics found in the region designated. Among these are five new species, viz., *Agaricus miamensis*, *A. granosus*, *A. monadelphus*, *A. estensis*, and *A. alboflavus*, all of which are excellently illustrated by large lithographic plates. A second paper is promised which will treat in a similar manner the remaining Agaricini.——Dr. C. S. Dolley, of Rochester, N. Y., has again deserved the thanks of biological students by translating Dr. T. W. Engelmann's paper on "The Physiology of Protoplasmic Motion." It is issued as a neat pamphlet of forty pages, and is well worth the price asked, viz., fifty cents.——We are to have another fern book; this time from the pen of Mr. G. E. Davenport, whose name is a sufficient guarantee of the excellence of the work. He has just published "Some comparative tables showing the distribution of ferns in the United States," as preliminary to his promised book. One hundred and fifty-five species are enumerated, and their geographical range given.——"The Bacteria," by Professor T. J. Burrill, is a stout pamphlet of sixty-five pages devoted to the discussion and description of Bacteria and the Saccharomycetes. The descriptions are mainly translated from Winter's edition of Rabenhorst's *Kryptogamen Flora*. It is a valuable addition to the literature of these interesting plants.——Those wishing to add to their stock of valuable papers on the Bacteria, will do well to secure a copy of Dr. D. E. Salmon's "Investigation of Swine Plague, Fowl Cholera and Southern Cattle Fever," in the Report of the Department of Agriculture at Washington, for the year 1881–2.——In the same report Dr. Vasey has a paper on grasses and other forage plants, illustrated by twenty-five full-page plates. These annual papers by Dr. Vasey have long given much value to the Department reports.——The March *Torrey Bulletin* contains among other interesting notes, one by Dr. Vasey on "Three hybrid Oaks," with three plates; "New and little-known Ferns of the U. S.," by Professor Eaton, and "A list of Western Grasses," by F. L. Scribner.——The "Lectures to the employés of the Baltimore and Ohio Railroad Company," delivered last

year and now issued in pamphlet form, include one "On Fermentation," by Dr. Sedgwick, which is a model of simplicity coupled with accuracy. Excellent figures are given of yeast plants and many forms of Bacteria.——Dr. Rothrock has been studying the microscopical distinctions between good and bad timber, some of the results of which he embodied in a paper read before the Am. Phil. Society, Feb. 2, 1883. A plate accompanies the paper. We should like to see more work like this done.——In the April *Journal of Botany* appears a list of "New genera and species of Phanerogams published in periodicals in Britain in 1882," which ought to find a counterpart in some of our American journals for American plants.——J. C. Arthur describes and figures a new variety of the common walking-leaf fern (*Camptosorus rhizophyllus* Link., var. *intermedius*) in the April *Bot. Gazette.* It approaches *C. sibiricus* in shape of leaf and character of the fibro-vascular bundle. It was collected on limestone cliffs in Eastern Iowa.

ENTOMOLOGY.[1]

THE NEW CLASSIFICATION OF THE COLEOPTERA OF NORTH AMERICA.—This important work, prepared by Drs. LeConte and Horn, and to which we referred to on p. 515 of last year's NATURALIST, has just been published by the Smithsonian Institution as No. 507 of its Miscellaneous Contributions. Its appearance will be hailed with joy not only by coleopterists in this country, but by all those interested in Entomology. It is a stately volume of 567 pages, and though the general arrangement of matter is as in the first "Classification," the present volume is much more than a mere second edition thereof. In the former work the Phytophaga, Rynchophora and what was formerly known as Trimera were not reached, whereas the new classification covers the whole order, is almost entirely re-written, and is brought up to date.

The general arrangement of the families is in the main that proposed by Crotch, with but one important change, viz., that the Serricornia are placed before the Lamellicornia, the authors justifying this change by the close relationship existing between some members of the Clavicorn series and the Serricornia. This relationship, in the arrangement usually adopted, was interrupted and obscured by the interposition of the Lamellicornia.

The Platypsyllids and the Stylopids are given but family rank in the Clavicornia and Heteromera respectively.

To the beginner we especially recommend a careful study of the introduction, which gives a very clear exposition of the external anatomy of the Coleoptera, illustrated by original figures drawn by Dr. Horn.

[1] This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., may be sent.

A welcome addition to the volume is Mr. Henshaw's bibliography, consisting of a complete list of references to all the monographs or synopses of families, genera or species that have been published.

A PRETTY AND UNIQUE GALL-MAKING TORTRICID.— In May, 1882, we received through Mr. H. K. Morrison, from Ft. Grant, Arizona, some elongate galls—mere swellings of the stem—on a sensitive plant, *Acacia felicina*. The moths issued during June and July, and proved to be one of the most striking, pretty and exceptional Tortricids known. The accompanying figure will show the general markings, but will convey no adequate idea of the beautiful coloring which is chiefly pruinose, resembling the delicate bloom on a damson with a terminal band of delicate crimson, contrasting with streaks of metallic steel-blue, deep rich brown, straw-yellow and carneous. We append a description under the genus Grapholitha, with which it has the closest affinities and to which Lord Walsingham, who has examined specimens, would refer it.—*C. V. Riley.*

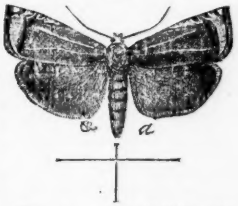


FIG. 1.— *Grapholitha ninana*; hair-lines showing nat. size.

GRAPHOLITHA NINANA, n. sp.—Average expanse 1.9^{mm}. Head with the face and palpi delicate sulphur-yellow; top pink; antennæ dark-brown or black. Thorax bluish-gray with variable metallic shades according to direction of light, the collar being more lilaceous. Primaries pruinose, the general color delicate purplish-gray with a pruinescent bloom and with two longitudinal streaks of deep carneous, the inner border margined with a streak of same color. Costa pale straw-yellow with a series of six brown-black, costal spots (sometimes one or two intermediate ones indicated) which, with the yellow, widen toward the apex, the terminal spot being transversely oval and sub-apical; the first is linear, begins about the middle of wing and connects more or less distinctly with a black line which obliques posteriorly and makes an elbow almost at right angles across the terminal fourth of wing; a black terminal line also runs from sub-apical spot along posterior border, the intervening space between these lines being of a delicate pink verging in places to crimson, with metallic, pale, steel-blue or lavender lines as follows: one coincident with elbowed black line posteriorly and broadest across the wing, an abbreviated one under the third costal spot, a longer one connecting that on oblique line, and a still longer one, slightly waved, extending from spots three to six. A few such metallic scales are sometimes in the pink field, and more often on inside of transverse black line, while some black scales are also observable in the pink field (three specimens); fringes brown, faintly metallic; secondaries dark brown with pale fringes; wings beneath dark brown, strongly iridescent, the costal marks repeated, a pale basal streak along middle of primaries and a more distinct one running the whole length along the upper third of secondaries; legs pale, the tarsi annulate. Abdomen concolorous with secondaries.

Described from four ♂s, three ♀s. Slight variation in minute details, and but unimportant colorational differences between the sexes.

SIMULIUM FEEDING ON OTHER INSECTS.—Dr. Hagen (the *Entomologist's Monthly Magazine*, April, 1883, pp. 254-5) considers that Simulium may, after all, prove useful to man by causing the destruction of large numbers of chrysalides of *Pieris menapia*, which is so injurious to pine trees in Washington Territory. Al-

though no direct observations were made on the subject, Dr. Hagen thinks that the black-flies attack and suck the helpless chrysalides. That Simulium can subsist on insect blood is not strange, since fleas and mosquitos are known to so subsist, and the correctness of the belief seems to be corroborated by the circumstance that in those places where the Pieris abounded Simulium molested neither man nor beast; while where the butterfly was wanting the travelers were exposed to the usual annoyance by the flies.

Longevity in a Beetle.—Dr. D. Sharp notes (*Entomological Monthly Magazine*, April, pp. 260–1) that he kept a female of a water-beetle (*Dytiscus rœselii* Fabr.) alive for nearly five years, and that during the first two years a male accompanied her. Copulation between the two insects was actually observed, yet a post-mortem examination of the female showed the ovaries very small, the tubes containing no eggs, and, so far as known, the beetle never deposited any.

Dr. Sharp explains this fact that, in his experience, it is very difficult to get the larger Dytiscidæ to oviposit in confinement, and that the eggs are only developed in the ovaries under circumstances suitable for their deposition.

Synopsis of the N. A. Heliothinæ.—Mr. John B. Smith gives us, in the Transactions of the American Entomological Society (Vol. x, pp. 205–255) a synopsis of this sub-family, or group, as he prefers to term it. The paper is illustrated with two plates, one of outlines showing the typical venation of the primaries, the armature of the front tibiæ, and some forms of the clypeus; the other of shaded wings which seem to be produced by the photo-engraving process and are extremely unsatisfactory, a fact due, probably, more to the character of the drawing than to the process. The Synopsis will be of service to students of the sub-family, and shows rather forcibly the loose character of much of Mr. Grote's work, which, except as to specific descriptions, must surprise and perplex all who conscientiously study the Noctuidæ with a view of getting at their true relations. Mr. Smith modestly admits that no really scientific classification of the sub-family has yet been made, and that his classification may be entirely superseded. The fact is that our Noctuidists have been governed rather by individual opinion than by the conviction which serious study brings, in their ideas as to the value of genera, and as Mr. Smith well remarks, there are almost as many different courses as authors. Mr. Smith, who in a previous paper (*Canadian Entomologist*, April, 1882) has shown how few reliable generic characters the Noctuids present, has, in the Heliothinæ, depended on the form of the eyes, of the clypeus, of the vestiture of the thorax and on the structure of the tibiæ, finding the venation very uniform and of no generic value. His paper is a calm and conscientious at-

tempt at a correct arrangement of the sub-family. Where trivial characters are deemed of generic use we think wing design or ornamentation should not be entirely neglected, but might be considered with advantage. Mr. Smith cites a few larvæ, but a number more are known, and where those of species such as *Heliothis armigera* (Hubn.) and *H. dispaceus* (L.) [*phlogophagus* Grt.] have been so long known and fully described, nothing is gained by quoting later and less complete descriptions.

Stylopised Andrenæ.—In the *Entomologische Nachrichten* for March 1, 1883, there is an interesting article by Mr. H. Friese on the successful collecting of *Stylops aterrimus* by digging up in winter time the colonies of *Andrena pratensis*. He remarks that, according to his observations, the stylopised Andrenæ have a much denser pubescence on the abdomen than those not infested with the parasite.

Death of Professor Zeller.—It was with deep regret that we received the announcement of the death from heart-disease on the 27th of March at Grünhof near Stettin, Prussia, of Professor Philip Christoph Zeller. His chief entomological work was on the Lepidoptera and especially on the smaller moths, as the Noctuidæ, Tineidæ, Tortricidæ and Pyralidæ. Of late years he published much on American species and his work was of the most trustworthy and thorough character. He wrote us a long and pleasant letter on the 20th of February last, sending us at the same time a number of his types of N. A. species which proved most instructive. We had just prepared a box of specimens to send him in return when the sad news reached us. Zeller was born April 9, 1808. He was beloved by all who knew him, and his place cannot easily be filled.

Fig Caprificators.— Two interesting articles upon the so-called "fig insects" are contained in Part 1 of the Transactions of the London Entomological Society for the current year. Sir Sidney S. Saunders gives reasons in detail for differing from Westwood as to the position of these caprificators, and concludes that they are Cynipids, giving the following arrangement of them:

CYNIPIDÆ Westw.

Sycophagides.

Division 1.—Prionastomata.
Blastophaga Grav.
Agaon Dalm.
Sycocrypta Coquerel.
Eupristina S. Saund.
Pleistodontes S. Saund.
Kradibia S. Saund.

Division 2.—Aploastomata.
Sycophaga Westw.
Apocrypta Coq.

Protection of Insect Collections.—The power which Trogoderma and other Dermestid larvæ affecting insect collections

exhibit in resisting the effects of insecticides is well known. They speedily recover from the effects of benzine; they will live for days in a tight jar filled with camphor or napthaline, and when they are within some dried insect they are unaffected even by the strongest volatile poisons, such as cyanide of potassium.

There are three prerequisites which we believe to be more important than insecticides in protecting insect collections. They are: 1st, absolutely tight boxes; 2d, the quarantining, for a sufficient length of time, of all specimens received through exchange or otherwise; 3d, the keeping of the boxes closed as much as possible during the time of the year when the parent Dermestid beetles most abound. In the climate of Washington this dangerous period extends from April till June—perhaps a little longer. At any other season there is not much danger from Dermestid beetles.

THE CHIGOE IN AFRICA.—It is stated in Burton and Cameron's "To the Gold Coast for Gold" that the chigoe (*Pulex penetrans*) has been recently introduced and has spread all over the West African seaboard and far into the interior. At the time of Captain Burton's first visit (1862) it was unknown on the west coast; but now it ranks with the indigenous red, white and black ants, centipedes, scorpions, venomous spiders and flies of the tzetze group, as among the chief plagues of that region.

COCOON OF TELEA POLYPHEMUS.—I notice this season that the *Telea polyphemus* as a general thing, if not universally, has fastened its cocoons to the twigs of the maple trees, whereas in previous years it has only fastened them to the leaves and fallen with them to the ground. This year as they are fastened to the twigs, they do not fall to the ground. Is this an unusual thing or not? An answer in the AMERICAN NATURALIST would oblige. —*Herbert Morris, Germantown, Pa.*

[In our experience we have found that while the cocoon of this species is usually found upon the ground where it has dropped with the leaves, yet it is quite frequently attached as above described, and as we have recorded in our Fourth Report on the Insects of Missouri (1871).]

THE SUCKING ORGANS OF BEES, BUGS AND FLIES.—Dr. K. Kræpelin has described in the *Zoölogischer Anzeiger* the mouth organs of the bee and certain Hemiptera and flies. In the humble bee the tube is composed of the labial palps and the maxillæ, which are connected with them by strips of [chitinous] substance; near their lower margin the paraglossæ intervene between the palps and the maxillæ. The half-canal formed by the upward curve of the margins of the labium gradually disappears towards the posterior part of the latter, and allows liquid which has passed down it to escape between the labium and maxillæ into the mouth, at the point of origin of the paraglossæ. Besides the tac-

tile hairs certain peculiar clavate pale hairs are placed on the apex of the labium, which appear from observations to be analogous to the olfactory hairs of the inner pair of antennæ of Crustacea, and, as they carry a minute opening at their ends, must be considered as either gustatory or olfactory organs.

Like that of butterflies, the sucking-tube of the Hemiptera is made up exclusively of the two maxillæ, which unite in such a way as to form a double cylinder, the upper division of which carries the food, the lower the salivary secretion. The mandibles lie by the side of the maxillæ, and can move about on the tube. The end of the labium is provided with terminal nervous organs. In the proboscis of Diptera the sucking tube is formed mainly by the labium, which consists of a demi-canal, closed below partly by the mandibles which are connected with it by a groove-and-ridge joint and partly by the hypopharynx, which runs below the mandibles, carrying the salivary canal; on each side below the hypopharynx lie the maxillæ.

THE "PINE MOTH OF NANTUCKET."—The author, Mr. S. H. Scudder, sends us, under this title, a neatly printed pamphlet of 20 pp., with a colored plate, published by the Massachusetts Society for the Promotion of Agriculture. It embraces an account of the injury to the pines (*Pinus rigida*) on the island of Nantucket by a Tortricid, *Retinia frustrana*, n. sp., with full descriptive details and remedial suggestions, and ends with an appendix giving Professor Comstock's account of injury to the scrub pines (*Pinus inops*) around Washington, as published in the report of the Entomologist, Department of Agriculture, for 1879. Mr. Scudder is inclined to doubt the specific identity of the insect working on *Pinus inops* and *P. rigida* in other parts of the country with his *Retinia frustrana*, but without very cogent reason. After study and comparisons we agree with Fernald and Comstock. This fact of the wide distribution of the species weakens the force of the practical conclusion of the pamphlet, which is that *by breaking or cutting from every pine tree on the island every affected shoot* the insect might be virtually exterminated—a conclusion which presupposes either that the species is confined to the island or that, being more widely distributed, the parent moth could not or would not fly from adjacent land. Mr. Scudder concludes that there are two annual generations. While two have been plainly made out for the latitude of Washington, it is yet doubtful whether more than one occurs, as a rule, so far north as Nantucket. The irregularity in development is apt to mislead, and in studying *Dapsilia rutilana* Hübn, on Long Island, some years since, we were forced to consider it monogenentic notwithstanding the appearance of the moths in early spring.

The popular name chosen by the author is rather unfortunate. Popular names for injurious larvæ are most appropriate when

they apply to the larva state and when they indicate distinguishing habits or characters among allied species.

ENTOMOLOGICAL NOTES.—A Trypeta "gall" discovered by Weyenbergh in the Argentine Republic on the terminal bud of a Heterothalamus resembles in appearance the froth produced by the well-known spittle-insect, but is somewhat more substanial in structure.——Mr. S. H. Scudder in *Science* for March 2, 1883, discusses the interesting discovery by Mr. Charles Brongniart, of the fossil Phasmidæ, from the upper coal measures of Commentry, reproducing his sketch of the gigantic *Titanophasma fayoli*.—— The *Stettiner Entom.-Zeitung* (1883, Nos. 4–6), contains the following articles of interest to the American student: Möschler's review of the Brooklyn Check List of Macrolepidoptera; on the scales on the wings of Geometridæ and their possible use for classification, by C. von Gumppenberg; continuation of C. Ploetz's Synopsis of the species of Hesperia; J. Lichtenstein's description of the Aphidid genus Schlechtendalia, and Dr. Rössler's remarks as to the best system of the Lepidoptera.——Une application de l'Entomologie à la Medicine légale, par M. Mégnin, in *Le Naturaliste*, February 1, 1883, relates to the discovery, in a house, of the dried up body of a child, the presence of certain Dipterous and Coleopterous insects in and on the body, enabling Mr. Mégnin to pretty accurately fix the date of the death of the child.——*Xylotrechus annosus* Say, breeds, according to Mr. Coquillett, in willow, the beetle having apparently oviposited in the wood after the tree had been cut down (*Can. Ent.*, Feb., 1882).——Mr. W. H. Edwards indefatigably continues to describe the preparatory stages of North American Lepidoptera, his numerous papers on this subject being, every one of them, examples of careful and conscientious workmanship.——Raphael Meldola discusses the mimicry between butterflies of protected (*i. e.* unpalatable or otherwise unacceptable to birds) genera by which the more common species is imitated by the rarer (*Ann. and Mag. Nat. Hist*).——The Proceedings of the Boston Society of Natural History, Vol. XXI, Part IV, January, 1882–April, 1882, published March, 1883, contain the following entomological papers: A new and unusually perfect carboniferous cockroach from Mazon creek, Ill., by Samuel H. Scudder; Notes on some of the Tertiary Neuroptera of Florissant, Colo. and Green river, Wyoming Terr., by Samuel H. Scudder. Another interesting paper, though not directly relating to entomology, is by Wm. Trelease on the structures which favor cross-fertilization in several plants.——Mr. G. N. Milco, superintendent of the Buhach Producing and Manufacturing Co., Stockton, Cala., estimates this year's Pyrethrum crop of the company's farm in Mercer county, to be at least forty tons.——Fritz Müller shows (*Kosmos*, March, 1883, p. 448) that chrysalides of *Papilio polydamus* from larvæ raised under like conditions were of varying color, a fact that holds equally true of our own Papilios. He

also criticizes (*ibid*, pp. 466-9) Hagen's paper on "The color and pattern of insects."——Dr. Edward Hoffer (*ibid*, pp. 412-421) gives some interesting facts as to the nest-building of humble-bees.——We regret to see that with the change of political power in California there has been a change in the officers of the Horticultural Commission that does not seem to be an advantage. Bitter complaint is made, for instance, of the removal of Mr. Matthew Cooke, who has been indefatigable in his labors on the commission.——Some vine cuttings from Madeira were recently held in New York in the belief that they were affected by Phylloxera. Specimens were sent by Collector Robertson to the State Department and finally submitted to us for examination and suggestion. We advised their immediate forwarding, as there were no grounds for their detention.

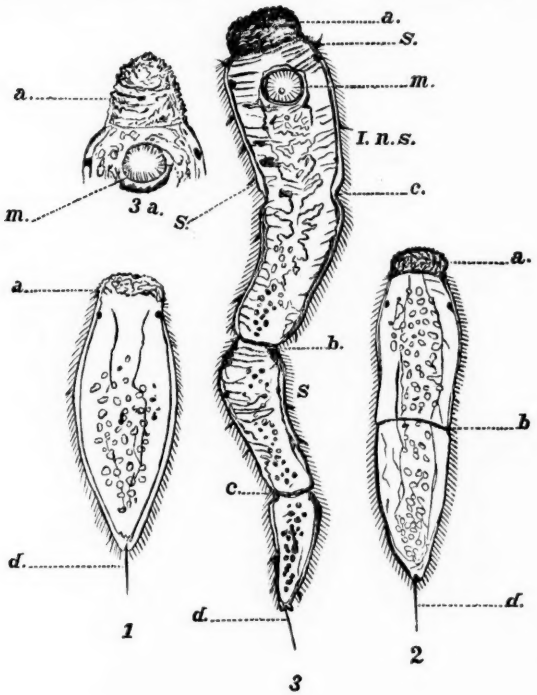
ZOÖLOGY.

THE EMBRYONIC TENTACULAR KNOBS OF CERTAIN PHYSOPHORES.—While investigating the anatomy of the tentacular knobs of several genera of Calycophores, I was struck by their close resemblance to the "embryonic knobs" of Agalma.

If the terminal filament of the Calycophore knob be reduced to nothing, we have left a tentacular appendage homologous with the embryonic knob of Agalma, Physophora, Agalmopsis and other Physophores. This resemblance seems to me to have a genetic significance, and to indicate a relationship between two great groups of Siphonophora, called the Physophoræ and Calycophoræ. In order to strengthen this supposition I was led to search out other resemblances in the larvæ in which these structures are found. The result was that an interesting likeness between the single ("embryonic") nectocalyx of Monophyes and the "primitive scale" of Agalma was found. The following reasons led me to regard these last-mentioned organs as homologous. Both are formed in the same way, both are embryonic and are lost in subsequent development. We have in the "primitive scale" of Agalma an indication of the point in the development of the Siphonophora, where the separation of the Physophoræ from the Calycophoræ, or where the separation of both groups, from a "stem form," took place. The embryonic bell of Monophyes is an organ of motion; the primitive scale of the young Agalma, although homologous to a bell, has lost the function of motion, and is an organ of flotation, while in Agalmopsis (Halistemma) the embryonic bell is not even represented. The only structure in the larva of Agalmopsis (Halistemma), which shows the relation of this genus to the Calycophoræ is an embryonic tentacular knob, like that of the larva of Agalma, which is thought to be homologous to the tentacular appendage of the Calycophores. This statement of a possible genetic relationship between these

two groups is not held to apply to the Pneumatophoræ ("Pneumatophoridæ" Chun), nor to the Discoideæ.—*J. Walter Fewkes.*

NOTE ON ALAURINA PROLIFERA BUSCH.—The rich pelagic fauna of New England waters contains many genera and species of marine Turbellaria which have not been studied by American zoölogists. The accompanying sketches of Alaurina do not add



EXPLANATION OF THE FIGURES.—FIG. 1.—Single asexual (?) Alaurina, the walls of which are destitute of constrictions. There is a non-ciliated proboscis, two eye-spots and a terminal posterior spine; the body is ciliated. FIG. 2.—Alaurina with a single constriction (*b*); this worm was found free swimming and may be an older larva of Fig. 1, or the posterior of the two worms which are united in the next figure. FIG. 3.—The oldest specimen of an asexual Alaurina which was observed; in this worm we have a deep constriction (*b*) midway between the anterior and posterior extremities of the body; this constriction has been seen to deepen and the two worms to separate from each other at that point; the posterior of the two worms represented as united in Fig. 3, has four eye-spots, two large and two small, situated close together, of these the anterior are the smaller. FIG. 3*a*.—Head of the last (Fig. 3) with extended proboscis (ventral view); *a*, non-ciliated "proboscis," which is covered with small papillæ; *b*, deep constriction which has been seen to divide the asexual Alaurina into two worms; *c*, shallow constrictions; *d*, terminal posterior spine; *m*, mouth (ciliated). There is no vent. *n.s*, natural size of worm represented in Fig. 3; *s*, lateral "spines."

anything to what is already known of the anatomy and development of the genus through the researches of Busch, Metschnikoff, Mereschkowsky and others, but are published simply to call attention to its interesting development. This species, as already stated, has been taken from only one other locality. Other species, however, as *A. composita* Metsch., have been found in the Atlantic ocean.

Color green and yellow, transparent and slightly phosphorescent. All the above-mentioned specimens were taken with a Müller's net in Narragansett bay.—*J. Walter Fewkes.*

Enormous Spider's Web.—When in Franconia valley, N. H., last summer, my wife and myself observed a spider's web of such enormous proportions that it seems worth while to put the phenomenon on record. I regret that I was so foolish as to omit, at the time, taking accurate measurements. The web was of the geometrical kind—very perfect, and stretched between two trees, one a small larch and the other a large sugar maple. The total length of the guys or supports must have been fifteen feet at least, while the web proper was, I should say, all of three feet in circumference. In my desire to be within bounds I really think I under-estimate the dimensions. The span of threads indicated a very large builder, but our utmost search failed to find this architect. I should greatly like to know what species probably constructed this enormous trap.—*W. W. Bailey.*

The Structure and Formation of the Covering of the Decapoda.—The structure of the decapod carapace has usually been examined long after the time of molting, when it is largely composed of calcareous matter, but M. Vitzon, a pupil of Paul Bert and of Lacaze-Duthiers, has studied the recently-formed teguments, and has cleared up much of the mystery attached to the method of change. M. Vitzon has demonstrated that, between the chitinous layer and the chorion or dermis, there also exists an epithelium, and that the carapace is not a secretion of the dermis, as stated by Milne Edwards, but is formed from the cylindrical cells of the epithelium, which are cylindrical, and, during the molting period lengthen considerably, and the more external cellules part away to give origin to the carapace by successive thickenings.

After the new covering is formed, the cylindrical epithelial cells are shorter by one half, and an examination of the chitinous covering some time after reveals four layers: a yellowish and very delicate cuticle, continuous over the whole surface, except where pierced by hairs; a thicker pigment layer, consisting of superposed lamellæ, enclosing calcareous salts and traversed by perpendicular pore-canals; a thick layer, constituting by far the greater bulk of the carapace, white, and formed of calcified lamellæ, traversed by the same perpendicular canals that pierce the preceding, and a thin layer consisting of lamellæ without lime salts.

Below the chitin-forming epithelium, is a bed of conjunctive tissue, having all the essential traits of the dermis of higher animals.

When the animal molts, it casts off only the external layer of the epidermis, and below this may be already seen other yet soft chitinous beds proceeding from the epidermis.

The digestive canal of the Crustacea is lined by a chitinous bed, the structure and mode of formation of which is the same as that of the external teguments. In examining this lining, M. Vitzon discovered the presence of salivary glands.

The internal as well as the external lining is cast off in the molt, but the Brachyura and Macroura do not molt in the same manner. The former keep their usual posture during the change, the abdomen is freed before the cephalo-thorax and chelæ, and the carapace separates from the epimera. The latter lie upon their side, the membrane between the cephalo-thorax and first abdominal somite is broken, and the cephalo-thorax is freed at once.

By measurements of the rejected carapace and of the animal, before and after its change of covering, M. Vitzon arrives at the belief that the increase in size of the creature takes place before the change, which is caused by it, and not, as usually stated, during the time that the carapace is soft.

Previous to the formation of the chitinous envelope, a layer of glycogenous matter is deposited around the body below the carapace, and this reserve of nutritive matter has disappeared after the new tegument is formed. These glycogenous substances are constantly being stored up in the liver, ovaries, lymph, etc., ready for the change that will exhaust them. In the Macroura, calcareous depositions are formed in the stomach previous to the molt, and in the Brachyura lime salts are abundant in the blood when the time of the change approaches.

HINCKLEY ON THE MOUTH STRUCTURE OF TADPOLES.—The Proceedings of the Boston Society of Natural History contain the results of observations upon the mouth structure of the tadpoles of *Rana silvatica*, *R. catesbeiana*, *R. halecina*, *R. fontinalis*, *R. palustris*, *Bufo americana*, *B. fowleri*, *Hyla versicolor* and *Hylodes pickeringii*. The mouths of these tadpoles fall into three groups corresponding with differences of habit in the adults. All have a pair of horny, beak-like jaws, edged with numerous sharp-pointed teeth, and also several fleshy folds within the lips, one to three within the upper and two to four within the lower. These folds are set along their free edges with fine teeth, which appear to perform the office of a sieve, to collect food, and by the action of the lips convey it to the jaws. These folds are usually held out at right angles with the lip, but are laid back when the tadpole wishes to reject any substance caught. The under lip is fringed with papillæ. In Rana the upper lip is shorter than in the other groups, and the papillose edge of the margin of the under lip is

doubled inward at each angle of the mouth; in Hyla and Hylodes the upper lip is broad, and the border of the lower lip does not double inward at the corners of the mouth; while in Bufo it is broad and nearly straight, and the angles of the lower lip are doubled in. Tadpoles feed first upon the gelatinous envelope that surrounded the eggs they sprang from, and then by preference on animal food. The two toads have one fringed fold under the upper lip, and two on the lower; those of the Ranidæ vary in number; while the two tree-frogs have one above and two or three below. In some species the line of papillæ on the lower lip is broken by a central fringe like that on the folds. The papillæ appear to test the nature of the objects that touch the mouth.

Hybridization of Brook Trout and Grayling.—I think the brook trout and grayling could be crossed, provided the fish spawn at the same time of year. The brook trout cast their spawn in most of our streams during the fall and winter months and the grayling spawn during the spring months. I have crossed the striped bass with shad, herring with shad, white fish with salmon, salmon with brook trout and brook trout with salmon trout.

The last-mentioned cross is the most successful and valuable one we have made. They are fine fish. They are good breeders and the young are fine fish. We have a cross between brook trout and salmon trout hybrid, which makes them three-quarters brook trout and one quarter salmon trout. I think they will make a large trout, suitable for rivers and lakes. Next season I shall cross them again with brook trout, and the young will be seven-eighths brook trout and one-eighth salmon trout. None of the salmon trout and brook trout hybrids yet produced have the vermilion spots of the brook trout. I think if the three-quarters cross does not bring them out, seven-eighths will, and there will be a new family of speckled trout, that will grow to a large size and be a choice fish.

I think the grayling and the California mountain trout could be crossed, as they spawn the same time of year. If I lived in a grayling country I would know before another season passed. I think the cross will be made within a few years, and I consider it a very important point in fish culture. I have made many other attempts at hybridizing with more or less success.—*Seth Green, in the American Angler, May 13th, 1882.*

Effect of Birds on Insect Life.—In a recent brochure by S. A. Forbes, State Entomologist of Illinois, he shows that, in considering the effects of birds on insect life, there are three questions to answer, as follows:

1. Do birds originate any oscillations among the species of insects upon which they feed? That is, are their food-habits ever so inconstant from year to year that species which are at one time principal elements of their food, are at other times neglected and allowed to multiply, without restraint?

2. Do birds prevent or restrain any oscillations of insects now noxious, or capable of becoming so, if permitted to increase more freely? That is, do they bring to bear upon any such species a constant pressure so great that those insects would increase unduly if this pressure were removed by the destruction of the birds?

3. Do they do anything to reduce existing oscillations of injurious insects? Do they sometimes vary their food-habits so far as to neglect their more usual food and take extraordinary numbers of those species which, for any reason, became superabundant for a time? In answer to the third question the paper has been prepared. Mr. Forbes selected an orchard which for six years had been stripped by canker-worms. He shot a considerable number of birds therein for two successive years, on May 24th, 1881, and May 20th, 1882, representing nearly all the kinds seen in the orchards, made full notes of the relative abundance of the species, examined carefully the contents of all the stomachs obtained, and tabulated the results as the basis of his paper. It appeared that the robin and twenty-six other species of the thrush family had eaten no vegetable food, 96 per cent consisting of insects, of which 16 per cent was canker-worms and only 4 per cent insectivorous beetles. The blue bird ate 12 per cent. of canker-worms; the house wren 50 per cent; fourteen warblers ate 75 per cent of canker-worms; thirty cedar waxwings destroyed 3000 canker-worms a day, or 90,000 for the month during which the worm is exposed, while forty-seven finches, or "seed-eaters," ate 98 per cent of insects, of which 40 per cent were canker-worms. Mr. Forbes concludes:

1. That birds of the most varied character and habits, migrant and resident, of all sizes, from the tiny wren to the blue jay, birds of the forest, garden and meadow, those of arboreal and those of terrestrial habit, were certainly either attracted or detained here by the bountiful supply of insect food and were feeding freely upon the species most abundant. That 35 per cent of the food of all the birds congregated in this orchard should have consisted of a single species of insect is a fact so extraordinary that its meaning cannot be mistaken. Whatever power the birds of this vicinity possessed as checks upon destructive irruptions of insect life was being largely exerted here to restore the broken balance of organic nature.

2. The comparisons made show plainly that the reflex effect of this concentration on two or three unusually numerous insects was so widely distributed over the ordinary elements of their food that no especial chance was given for the rise of new fluctuations among the species commonly eaten.

3. The fact that, with the exception of the indigo bird, the species whose records in the orchard were compared with those made elsewhere had eaten in the former situation as many cater-

pillars other than canker-worms as usual, simply adding their canker-worm ratios to those of other caterpillars, goes to show that these insects are favorites with a majority of birds.

THE HAIRY WOODPECKER, A CORRECTION.—Referring to the interesting communication of A. G. Van Aken (AM. NAT., May, 1883, p. 511) upon the hairy woodpecker, there is apparently the often repeated mistake made of confounding the work of the hairy and the yellow-bellied woodpeckers. Our author says: "The perforations which he makes are merely for the purpose of securing his quarry from their ensconsure neath the bark out of the reach of other agencies."

Now, if the circular holes arranged in horizontal lines in the bark of fruit and other trees are referred to, there are two remarks to be made: 1st. These holes are not made by the hairy woodpecker at all. 2d. They are made by the yellow-bellied woodpecker (*Sphyrapicus varius*), not for the purpose primarily of obtaining insects, but for the inner bark and sap. This correction has often been made, but that there is further need of it is evidenced in many ways besides the particular statement referred to. The two birds and their work are all but universally confounded by the farmers and fruit growers of my acquaintance. The one is, however, decidedly useful; the other, though insect-feeding in part, does to the orchards and ornamental trees far more injury than good. Among these trees the one should be carefully protected, the other shot.—*T. J. Burrill, Champaign, Ill., April 23, 1883.*

ZOOLOGICAL NOTES.—*Protozoa.*—Mereschkowski finds in an infusorian named by Cohn *Acarella siro*, a link between the Ciliate and Suctorial infusoria. The Acinetines present cilia in some stages of their development, but otherwise the groups have hitherto been regarded as quite separate. *Acarella siro*, which abounds in the Bay of Naples, has a somewhat pyriform body, ending in front in a small conical neck, at the base of which is a collar of long cilia in three superposed circles of seven or eight each. Upon the margin of the orifice of the neck four suckers are always present, constructed, like those of the Acinetina, of a slender peduncle, ending in a globular enlargement. It creeps slowly at times, at others, moves by sudden leaps, in both cases by the action of its cilia. H. J. Waddington publishes in the Journal of Royal Microscopical Society the results of some experiments on the action of tannin on the cilia of Infusoria, especially *Paramæcium aurelia*, the immediate action of the tannic acid rendering the cilia visible without any manipulation of the light. Also by the use of sulphurous acid Infusoria are at once killed, and in most cases, if the Infusoria are ciliate, the cilia are rendered visible; but if the Infusoria are only partially killed, they become

almost motionless, while the ciliary action may be well observed. ——A parasite has been lately found on the skin of a young trout, by M. Henneguy, those in an aquarium at the College of France having suffered much from it. The organism is a flagellate Infusorian, and is named, provisionally, *Bodo necator.*

Echinoderms.—The stalked Crinoids of the Carribean sea have been worked up in a preliminary way by Mr. P. H. Carpenter in the Bulletin of the Museum of Comparative Zoölogy—the final report to appear in those of the *Challenger* Expedition.——Among the numerous interesting finds of the *Travailleur* in recent cruises is a new Eudiocrinus, being the fifth species at present known. These animals belong to the family of the Comatulidæ. The new animal is distinguished as *E. atlanticus*, the four others having been found in the Pacific. It was dredged in the Bay of Biscay, in a depth of 896^{m}. The Eudiocrini have only five arms (while the other Comatulæ have at least ten). While those of the new form are simple, they are far from being of primitive type. The animal is not able (like the others of the same group) to fix itself firmly to foreign bodies; it probably rests on the sea-bottom with arms and cirri spread out, not having to fear either waves or currents. But the muscular masses of its arms show that it must be a good swimmer. Fifteen specimens were obtained.

Mollusks.—From C. Ashford's observations (*Journal of Conchology*, July, 1882), on the action of the heart in the snails (Helicidæ) during hibernation, it appears that circulation goes on slowly when the thermometer is not below 26–28° F. Observations were not made at a lower temperature than this, owing to the mildness of the English winter, but Mr. Ashford thinks that the broad statement that the heart remains motionless throughout hibernation needs modification. In this country, with its cold winters, it would be comparatively easy to examine the question and perhaps settle it. The Bulletin of the United States Fish Commission contains an article translated by J. A. Ryder, from the Dutch of Dr. R. Hoorst. That observer speaks of artificial impregnation as impossible in the case of the common oyster. He asserts that the bivalve shell develops from a simple unpaired rudiment, in opposition to the observations of Lacaze-Duthiers and Brooks. The description of the development of the shell in Teredo, as given by Hatschek, agrees with that observed by Hoorst in the oyster, and the latter thinks it safe to assume *that the development of the shell in all mollusks takes place the same way*, which bears out the monophyletic theory of the descent of the mollusca, advocated by Von Ihering.

Vertebrates.—In the Bulletin de la Société Philomathique de Paris M. Al. Thominot describes *Saccodon cranocephalum*, a Characinid from the Rio Guyaquil. The teeth are small, smooth and

mobile. On account of the form of the teeth and the mode of their implantation, the author proposes to unite the genera Saccodon, Hemiodus, Parodon, Prochilodus, Citharinus and Cænotropus as a sub-family with the name of Citharinina. A number of ichthyological papers by Mr. T. Gill, appear in late signatures of the Proceedings of the United States National Museum. The synonymy of the class Leptocardians is given, followed by a note on the Marsipobranchs in general, and a second one on the Bdellostomidæ and Myxinidæ; and a third one on the Petromyzontids. He also gives a supplementary note on the Pediculate fish, with other brief articles. He discusses the relationship of the Echeneidids which he regards as a sub-order, which he names the *Discocephali*, and states that the basis cranii is simple.——Messrs. Jordan and Gilbert also notice certain neglected generic names of Lacépède, and discuss the synonymy of the genus Bothus of Rafinesque.——*Nature*, in reporting the Proceedings of the Linnean Society of New South Wales, states that Mr. Morton has ascertained that the Australian lung-fish, Ceratodus, spawns in the Burnett river during the months of June, July or August, the spawn being deposited in a slight excavation formed in the bed of the river, at a depth of eight or ten feet, the male and female remaining in close attendance on it until hatched. Arrangements had been made by which it was hoped that a supply of the spawn might be obtained for observation next season. Most interesting results would doubtless follow from a study of the embryology of a Dipnoan fish.——The respiratory organs of the kiwi or Apteryx have been examined by Professor Huxley, whose paper appears in the Proceedings of the Zoölogical Society of London. He asserts that the respiratory organs of Apteryx are thoroughly ornithic, differing from those of other birds chiefly in the greater width and smaller aggregate surface of the respiratory passages, in the rudimentary condition of the pneumatic sacs, and in the much greater strength of the pulmonary and septal aponeurotic expansions, and, in opposition to Owen's statement, that neither in Apteryx nor any other bird, has either of them the slightest real resemblance to a mammalian diaphragm. In this, as in all other cases, the meaning of ornithic peculiarities of structure is to be sought, not in mammals, but in reptiles. "It is only among reptiles that we meet with pneumatic bones similar to those of birds (Crocodilia, Pterosauria, Dinosauria), pulmonary air-sacs (Chamæleonidæ), and membranous expansions which are comparable to the septa in birds."——In *Forest and Stream*, for April 26, Mr. Everett Smith closes a series of notes on 293 species of Maine birds. In the same paper is noticed a flight of white pelicans in Iowa, supposed to number over 1000.——L. Stejneger's remarks on the systematic arrangement of the American thrushes in the Proceedings of the United States National Museum contain a criticism of Seebohm's Catalogue of Birds. Mr. R. Ridg-

way describes a new warbler from the island of Santa Lucia, W. I., a supposed new plover from Chili, and defines anew the genus Tantalus and its allies.——Mr. L. Belding catalogues a collection of birds made along the western coast of Lower California.—— Observations on four mules in milk, by Professor A. Dugès, of Guanajuato, Mex., are translated in the Proceedings of the United States National Museum. Although observations relative to the milk given by animals which have not passed through the state of gestation are few, still a number have been recorded, including some human beings. A mule in milk was observed by Dugès near Guanajuato. The animal had never given birth to offspring, nor had ever been served by an ass or horse. The mammæ had no nipples and were buried in the skin of the abdomen. On milking the animal "more than 400 grams of milk were drawn, which issued with much force and fell foaming into the vessel prepared to received it." Dugès also records three other similar cases.——In a paper in the same Proceedings on the birds of the Gulf of Nicoya, Costa Rica, by Mr. C. C. Nutting, three species of monkeys are noticed. Regarding the howling monkey (*Mycetes palliatus*) he says: "Its cry is the most diabolical, in the estimation of the writer, of all sounds issuing from animal beings." The "red monkey" (*Ateles melanochir*) is quite numerous, and is the largest in size of Costa Rican quadrumana. The most abundant kind, however, is the white-faced money (*Cebus hypoleucus*). "They were often quite annoying from their habit of throwing sticks, nuts, etc., at the traveler passing below them. They soon discovered the place where I took my morning bath, and were so annoying in this particular that I appreciated as never before the pathetic story of the 'Boys and the Frogs,' and had to shoot one of them in pure self-defense. But I felt like a murderer for it." He found the flesh of the "watousa" (*Dasyprocta cristata*) to be "in the opinion of the writer, the most delicious meat he ever had the pleasure of eating."

General.—Zoölogy in Spanish America:[1]—The perusal of the Resúmen del Curso de Zoölogia, given at the Central University of Caracas, leaves the impression that there is some little stirring of the intellectual waters in that direction.

The classification adopted, albeit the "Estruciones" or Ratitæ, are intercalated between the Gallinæ and Palmipedes, and though the arrangement of both fishes and batrachians is somewhat out of date, is better than some to be found nearer home.

[1] Resúmen del Curso de Zoölogia, leido en la Universidad Central. Por A. ERNST. Caracas, 1882.

PHYSIOLOGY.[1]

A TEXT-BOOK OF PHYSIOLOGY.[2]—Dr. Foster's work may well be regarded as epoch-making in the history of English text-books of physiology. Few authors have combined the capability and appreciative insight necessary to the treatment of this subject as a science. Physiology is a chain of reasoning connecting isolated phenomena, and the study of that subject calls into play to the fullest that mental discipline which gives the power of sifting the true from the false and the acquirement of which is, in a measure, the design of the student's labors. A great drawback to the general usefulness of Dr. Foster's book has been the fact that the discussions contained in it were on a scientific plane to which the average medical student could hardly transport himself. In the new edition, however, the author has sought by the omission of the discussions of many disputed points and by the introduction of new diagrams, to render his book especially useful to the medical student; there is given us, accordingly, a clear presentation of practical information in which, at the same time, the scientific aspects of physiology are held in full view.

COMPARISONS OF STRENGTH BETWEEN LARGE AND SMALL ANIMALS.—M. Delbeuf, in a paper read before the Academie Royale de Belgique and published in the *Revue Scientifique*, reviews the attempts of various naturalists to make comparisons between the strength of large animals and that of small ones, especially insects, and shows that ignorance or forgetfulness of physical laws vitiate all their conclusions:

After a plea for the idea, without which the fact is barren, M. Delbeuf repeats certain statements with which readers of modern zoölogical science are tolerably familiar, such as the following: A flea can jump two hundred times its length; therefore a horse, were its strength proportioned to its weight, could leap the Rocky mountains, and a whale could spring two hundred leagues in height. An Amazon ant walks about eight feet per minute, but if the progress of a human Amazon were proportioned to her larger size, she would stride over eight leagues in an hour, and if proportioned to her greater weight, she would make the circuit of the globe in about twelve minutes. This seems greatly to the advantage of the insect. What weak creatures vertebrates must be, is the impression conveyed.

But the work increases as the weight. In springing, walking, swimming or any other activity, the force employed has first to overcome the weight of the body. A man can easily bound a height of two feet, and he weighs as much as a hundred thousand grasshoppers, while a hundred thousand grasshoppers could leap

[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.
[2] A Text-Book of Physiology. By Dr. M. FOSTER, M.A., M.D., F.R.S. 4th (Eng.) ed.

no higher than one—say a foot. This shows that the vertebrate has the advantage. A man represents the volume of fifteen millions of ants, yet can easily move more than three hundred feet in a minute, a comparison which gives him forty times more power, bulk for bulk, than the ant possesses. Yet were all the conditions compared, something like equality would probably be the result. Much of the force of a moving man is lost from the inequalities of the way. His body, supported on two points only when at rest, oscillates like a pendulum from one to the other as he moves. The ant crawls close to the ground, and has only a small part of the body unsupported at once. This economizes force at each step, but, on the other hand, multiplies the number of steps so greatly, since the smallest irregularity of the surface is a hill to a crawling creature, that the total loss of force is perhaps greater, since it has to slightly raise its body a thousand times or so to clear a space spanned by a man's one step.

By what peculiarity of our minds do we seem to expect the speed of an animal to be in proportion to its size? We do not expect a caravan to move faster than a single horseman, nor an eight hundred pound shot to move twelve thousand eight hundred times further than an ounce ball. Devout writers speak of a wise provision of Nature. "If," say they, "the speed of a mouse were as much less than that of a horse as its body is smaller, it would take two steps per second and be caught at once." Would not Nature have done better for the mouse had she suppressed the cat? Is it not a fact that small animals often owe their escape to their want of swiftness, which enables them to change their direction readily. A man could easily overtake a mouse in a straight run, but the ready change of direction baffles him.

M. Plateau has experimented on the strength of insects, and his facts are unassailable. He has harnessed carabi, necrophori, June-beetles (Melolontha) and other insects in such a way that, with a delicate balance, he can measure their powers of draught. He announces the result that the smallest insects are the strongest proportioned to their size, but that all are enormously strong when compared, bulk for bulk, with vertebrates. A horse can scarcely lift two-thirds of its own weight, while one small species of June-beetle can lift sixty-six times its weight. Forty thousand such June-beetles could lift as much as a draught-horse. Were our strength in proportion to this we could play with weights equal to ten times that of a horse, while an elephant could move mountains.

This seems, again, great kindness in Nature, to the smaller animal. But all these calculations leave out the elementary mechanical law: "What is gained in power is lost in time." The elevation of a ton to a given height represents an expenditure of an equal amount of force, whether the labor is performed by flea, man or horse. Time supplies lack of strength. We can move

as much as a horse by taking more time, and can choose two methods—either to divide the load or use a lever or a pulley. If a horse moves half its its own weight three feet in a second, while a June-beetle needs a hundred seconds to convey fifty times its weight an equal distance, the two animals perform equal work proportioned to their weights. True, the cockchafer can hold fourteen times its weight in equilibrium (one small June-beetle sixty-six times), while a horse cannot balance nearly his own weight. But this does not measure the amount of oscillatory motion induced by the respective pulls. For this both should operate against a spring.

A small beetle can escape from under a piece of cardboard a hundred times its weight. Pushing its head under the edge and using it as a lever, it straightens itself on its legs and moves the board just a little, but enough to escape. Of course, we know a horse would be powerless to escape from a load a hundred times its own weight. His head cannot be made into a lever. Give him a lever that will make the time he takes equal to that taken by the insect, and he will throw off the load at a touch. The fact is that in small creatures the lack of muscular energy is replaced by *time*.

Of two muscles equal in bulk and in energy the shortest moves most weight. If a muscular fiber ten inches in length can move a given weight five inches, ten fibers one inch long will move ten times that weight a distance of half an inch. Thus smaller muscles have an absolutely slower motion, but move a greater proportional weight than larger. The experimenter before mentioned was surprised to find that two grasshoppers, one of which was three times the bulk of the other, leaped an equal height. This was what might be expected of two animals similarly constructed. The spring was proportioned to the bulk. In experiments on the insects with powerful wings, such as bees, flies, dragon-flies, etc., it was found that the weight they could bear without being forced to descend was in most cases equal to their own. In some cases it was more, but the inequality of rate of flight, had it been taken into the reckoning, would have accounted for this.

Take two creatures of different bulk but built upon exactly the same plan and proportions, say a Brobdignagian and a Lilliputian, and let both show their powers in the arena. Suppose the first to weigh a million times more than the second. If the giant could raise to his shoulder, some thirty-five feet from the ground, a weight twenty thousand pounds, the dwarf can raise to his shoulder, not, as might be thought, a fiftieth of a pound, but two full pounds. The distance raised would be a hundred times less. In a race the Lilliputian, with a hundred skips a second, will travel an equal distance with the giant, who would take but a skip in a second. The leg of the latter weighs a million times the most,

but has only ten thousand times as many muscle fibers, each a hundred times longer than those of the dwarf, who thus takes one hundred skips while the giant takes one. The same physical laws apply to all muscles, so that, when all the factors are considered, muscles of the same quality have equal power.—*W. N. Lockington.*

THE DIRECT INFLUENCE OF GRADUAL VARIATIONS OF TEMPERATURE UPON THE RATE OF BEAT OF THE DOG'S HEART.—In the Proceedings of the Royal Society, Professor Martin, of Johns Hopkins University, describes his researches upon the effect of changing temperatures upon the rate of beat of the dog's heart. The heart was perfectly severed from all physiological connection with the rest of body, with the exception of the lungs, and was nourished by an artificial stream of whipped blood. "As the result of many experiments it was found (1) that the isolated dog's heart beats quicker when supplied with warm blood, and slower when cold blood is supplied to it; (2) that the rate of beat depends much more upon the temperature of the blood in the coronary arteries than on its temperature in the right auricle or ventricle; (3) that when defibrinated calf's blood is used to feed the heart, that organ cannot be kept alive as long as when defibrinated dog's blood is employed; (4) that no matter how long an experiment lasts, the defibrinated blood, circulated again and again through the heart and lungs, shows no tendency to clot; hence fibrinozen is not produced in those organs.

The question answered by the first of the above results was the one for whose solution the research was undertaken. The experiments show that, in spite of its highly developed extrinsic nervous apparatuses, the heart of the mammal does, so far as its rhythm is concerned, in its own nerve-muscular tissues, respond to temperature variations within wide limits (42°–27° C.), just as the frog's heart or that of the embryo chick does. To account for the quick pulse of fever we, therefore, need not look beyond the mammalian heart itself; we require no theoretical assumption of any paralysis of inhibitory, or any excitation of accelerator cardio-extrinsic nerve-centers.

SKIN VISION.—In a recent communication to the Vienna Academy, Professor Graber, of Czernowitz, describes a long series of experiments with regard to the "skin-vision" of animals, affording exact proof that certain animals, without the aid of visual organs proper, can make not only quantitative but qualitative distinctions of light. These experiments relate chiefly to the earthworm as representing the eyeless (or "dermatoptic) lower animals, and to the *Triton cristatus*, as representative of the higher ("ophthalmoptic") eyed animals. In a table Professor Graber presents columns of numerical "cœfficients of reaction," indicating how many times more strongly frequented a space illuminated with bright red, green or white without ultra-violet, is, than

one illuminated dark blue, green or white, with ultra-violet respectively, the conditions being the same as regards light, intensity, radiant heat, etc. In one set of experiments the animals were in the normal state; in another, the anterior end of the worm, and the eyes of the Triton were removed.—*Nature.*

PHOSPHORESCENCE AND RESPIRATION IN ANNELID WORMS.—Mr. W. A. Haswell has investigated the structure and functions of the elytra or scales, the possession of which is one of the most characteristic peculiarities of the Aphroditacea.

With regard to the functions of the elytra, the author distinguishes (1) protection, (2) production of phosphorescent light, (3) sensation, (4) respiration and (5) incubation.

The protective function is in some cases the predominating one. Thus in Iphione the scales are of extreme density, and cover the entire dorsal surface with a complete armor. In others the scales, though tough, are more readily detached, and in many instances do not completely cover the dorsal surface, or are so delicate and so readily parted with when the animal is irritated, that their direct protective action must be very slight.

When certain species of Polynoë are irritated in the dark, a flash of phosphorescent light runs along the scales, each being illuminated with a vividness which makes it shine out like a shield of light, a dark spot near the center representing the surface of attachment where the light-producing tissue would appear to be absent. The irritation communicates itself from segment to segment, and if the stimulus be sufficiently powerful, flashes of phosphorescence may run along the whole series of elytra, one or more of which then become detached, the animal meanwhile moving away rapidly and leaving behind it the scale or scales still glowing with phosphorescent light. The species in which the phenomenon of phosphorescence occurs are species characterized by the rapidity of their movements, and also by the readiness with which the scales are parted with; and it seems not at all unlikely that the phosphorescence may have a protective action, the illuminated scales which are thrown off distracting the attention of the assailant in the dark recesses which the Polynoidæ usually frequent.

That the elytra act, like dorsal cirri, as organs of some special sense, seems probable from their abundant innervation, as well as from the presence, in many instances, of fimbriæ and other appendages, some of which act as end organs for the nerve branches.

In Aphrodita and Hermione the scales have been observed by Williams and Quatrefages to perform an important mechanical function in connection with respiration. In these genera the dorsal surface is covered with a coating of felted hairs, which stretch across from one side to the other, and enclose a canal open in front and behind, and having for its floor the dorsal wall of the body with the elytra and the "branchial" tubercles. These

authors regard the oxygenation of the perivisceral fluid as taking place through the thin integument covering the scale tubercles and the tubercles at the bases of the dorsal cirri, and having observed the scales to be subject to rhythmical movements by means of which a current of water is driven continually over the dorsal surface, thus renewing the water in contact with the "branchiæ." In species in which the felt-like dorsal covering does not exist, this function would appear to be in abeyance; and in Polynoë and allied genera, so far as Mr. Haswell has observed, the elytra remain perfectly motionless, while the animal as a whole is at rest.

The sexual products reach the exterior through apertures in the bases of the parapodia; and the ova are carried by ciliary action to the under surface of the scales, where they remain, adhering by means of a viscid matter till the embryos are well advanced. Impregnation probably takes place while the eggs are in this situation.—*Journal of Royal Microscopical Society.*

PSYCHOLOGY.

MATERNAL ANXIETY IN A HORNED TOAD.—I cannot designate the species of Phrynosoma, to which reference is here made, but my informant, to whom I showed several engravings, thinks it is *P. cornutum.* The following, which I am led to communicate with complete confidence in its truthfulness, I have taken from a friend, an educated lawyer: A full statement from him has been made to me several times, at intervals of some months. I made notes, and find my communicant agreeing closely in his facts every time. Hence I give the following as the pith of his statements:

It was near the South Platte cañon, where the foot hills reach the plains, on an afternoon in May, 1880. I was walking along a disused lumber road, when my attention was drawn to the strange movements of a horned toad. Instead of running away from me, I soon saw that it was making painful efforts to screen a young one from my observation. I was deeply impressed with the fact that it was a mother solicitous to save her little one from danger. The young one acted wildly, and aimlessly; and in manifest distress the mother would interpose herself between it and me, occasionally with a sidling motion against the young one, she would give its movements a direction of her own. In this way she got the little thing into a depression in the soil, where it squatted. I made no motion, but simply watched. But now, suddenly, the mother changed her conduct, which in fact became actually tactical, for she now tried to decoy me to herself, by making a short, rapid run at right angles to the line which I was taking. Then she stopped, and looked back. She would retrace a little distance of her flight, then turn again, and make another spurt of a run. I am positive that she was doing all this to with-

draw my attention from her little one. The mother was full grown, and the young one, I should think, was about one-third of her size.

So it seems this tiny cousin of the Iguanas has attractive psychic qualties, and so bird-like, too. But then if the bird heirs from the lizard, it should be an estate of body and of mind. But though a likeness in kind, how vastly superior to the inheritance in degree.—*S. Lockwood.*

BUFO AMERICANUS AT PLAY.—Except in the love season, so hermit-like is the common toad that I never suspect it of having a spark of frivolity or fun in its make up. It has seemed to me as the personification of a stupid stolidity. It catches insects. But should the bug play opossum, Bufo would be completely humbugged, for however hungry, it would not touch it. Bufo's eyes are everything. I do not think it can smell. If there is motion then it makes for the object. The glow-worm and fire-fly or lightning bug attract it. I knew an ignorant fellow who had his own fun with toads at night. He would burn a match, then break off the red-hot end, and throw it in sight of Bufo, who would gobble it up instanter, and a second one, if offered quick enough would disappear, about which time Bufo would wake up to the idea of a difference between fire-bugs and fire-brands, and that his host's entertainment was too warm to be wholesome. On one occasion I saw a very large Bufo under a gooseberry bush, whose shade sheltered him from the heat of the summer sun. I plucked some of the ripe fruit, and having sucked out the pulp I threw the sour rind so that it fell about an inch in front of the toad, making a slight rebound. Some folks have a proverb—"Where there's smoke there's fire." The Batrachian holds to a similar conceit—"Where there's motion there's life." The gooseberry husk disappeared in a trice. I threw another. Down it went, too—and a third, when the big goggle eyes seemed serious, as if looking into the matter. In vain I tried it again—Bufo had learned wisdom by experience.

Every one knows how a dog will play with a stick, and a kitten with a ball. Under the seat, where we resorted of an evening last summer, an old toad had his form or resting place. Into this damp spot his back parts were pushed, and from it his grave, golden eyes could watch while he waited for the cool of the evening. One evening he came out hopping as was his wont. A bit of dead twig had fallen from the tree overhead. Did he see it fall? I cannot say. But this is what was witnessed by more than one. He took up that twig in his mouth, and sat on his hind legs like a rodent. The toothless fellow could not bite the stick, but he did go through a queer performance with it between his big lips, his long-fingered hands upon it, as if he was improvising a flute. It was a comical sight. It is evident that the creature was playing with it. The whole thing was quite deliberate. Perhaps it occu-

pied two minutes—a long time for Bufo to keep his mind on so abstract a subject. He dropped the stick, hopped away several feet, then turned round, came back and went through the same performance again, in exactly the same way. He had now had his play out, and left for the lawn, bent on the more sober pursuit of getting his livelihood.

A toad may be made to learn. A friend at whose house was a basement, had several toads in the area. Towards evening they came out with much regularity to feed. It did seem that they knew her voice. They certainly had learned not to fear her presence. Whether they distinguished her from others I do not know—comparative or experimental observations are usually confined to naturalists. The observable fact is this: These toads had been taught reliance upon their benefactors. It was indeed beautifully said:

> —"The toad, ugly and venomous,
> Wears yet a precious jewel in his head."

I claim to have found "the toad-stone." The gem is psychic—a modicum of educability in Bufo's brain.—*S. Lockwood.*

Intelligence in the Elephant.—The following little incident is related as illustrating to what a remarkable extent the reasoning powers of the elephant may be brought out, as well as showing the control experienced animal-trainers have over these huge brutes. A medium-sized Asiatic male elephant with the P. T. Barnum and London Shows has been taught to perform the following: Dressed as a German, with a cap perched on his head, he is brought into the ring, and mounting a strong barrel he rolls it backward and forward with his four feet. He then takes a chair, sits on it before a table upon which is placed a bell, rings the bell, orders dinner, eats it, drinks out of a bottle, wipes his mouth with a big napkin, fans himself with a palm-leaf fan, stands on his hind legs, his fore legs, on his head, lies down, sits down upon the ground, rolls over, gets up, holds his trainer on his head, goes forward, backward, sideways, see-saws on a plank, plays an organ, walks on bottles arranged in a row, carries different articles, takes off his clothes with his trunk, rolls a tub with his nose, sets it on end, sits on it, and many other funny things, closing by pushing his trainer out of the ring. All this is done without a word being spoken to him.—*Exchange.*

A Story of a Dog.—Sometime during the past winter I accidentally learned the story of a black-and-tan terrier which seemed to me so noteworthy that I have been at considerable pains to authenticate it. I have now received the following details from the owner of the dog—Mr. W. S. Granger, of Providence, R. I.:

"At Christmas, 1880, our family all went to Newport to spend

a few days with a relative, Capt. Pitman, and Ponto being a member of the family, we took him along, going by rail, and landing at one end of the city. Capt. Pitman was then living near Elm and Washington streets, and Ponto remained there a week, but did not go around the city, and returned home by the same way that we went. The following summer Capt. Pitman having left Newport, his father was accustomed to take Ponto occasionally to Silver Spring (about twelve miles from Providence). One day arriving at the boat just as it was leaving, he jumped aboard and left the dog behind. The Newport boat left a few minutes later, and upon this Ponto jumped, and the boat making no landings, went on to Newport. Here he disembarked at the other end of the city, where he had never been, and from thence found his way to Capt. Pitman's former residence. The new occupants tried to turn him away, but he was bound to remain and make himself at home, which he did until the lady, who was then occupying the house, could write to Providence, when we sent for him. Now, how he could have found his way to the house in the short space of time, and after six months time, and never having been to the steamboat landing, I cannot tell. When first there, there had been quite a fall of snow and good sleighing, so that the whole appearance of the city was changed from his first to his second visit."—*W. W. Bailey.*

The Mocking Bird.—I have two mocking birds, *Mimus polyglottus*, taken from their nest in Concord, N. C., two years ago. They are marvelous singers, but my observations of them have been quite different from those of people generally, possibly because they have been petted more than usual. For the first few weeks, perhaps two months, we were very careful to feed them only mashed boiled potato and hard-boiled egg, well mixed, plenty of fresh water and what spiders and flies came in our way. We soon found they thrived much better to be fed by hand than when feeding themselves, and enjoyed greatly their outing in the sitting-room. One day, by accident, one escaped out of doors, and though usually very tame, his new surroundings rendered him quite unwilling to be caught. A close watch was kept of his whereabouts, and of anything he might do. Becoming hungry, but too much frightened to recognize the outside of his home, he finally flew into a neighbor's yard, and caught up a bit of cucumber pickle shaken from the table-cloth, and began *eating* it *vigorously*. When he was finally caught, and needed feeding, we did not hesitate to give him, and soon after the other also, anything which they would eat. When we put anything into their mouths which they did not like, even though it had been swallowed, they would eject it. The final result has been that the last eighteen months we have prepared nothing expressly for them, giving them whatever comes upon the ordinary family table. For cooked beef they manifest a greater fondness, whether fresh or corned, than any other meat,

and though fond of raw steak, it does not seem to assimilate nearly as well. Of course meal-worms, spiders and flies are always their preference, and to these they will help themselves freely, though this arises I think largely from their exhibiting life. Generally when hungry they stand with open mouths calling loudly for us to feed them. Besides beef, pork and veal as meats (mutton they dislike), their chief diet has been crackers and cookies, though the latest development is a love for corn and oatmeals when not ground too fine. For fruits in general they do not care particularly. They sing incessantly during the late winter, spring and summer, but are more silent, though not wholly so, during the molting period. By their side hangs a pet robin which sings constantly also, but our closest observation has failed to recognize from these "mockers" the first note closely imitating that of the robin, though they hear it so constantly, whilst other sounds, as peeping of chickens, mewing of a cat, snarling of puppies, filing a saw, and various bird notes, which they neither of them have heard, as the cage always hangs in the dining-room, constitute their chief delight. This has led me to inquire whether they *intentionally* produce any of these special sounds, or whether it is simply *their method* of singing. I do not question but that in some instances they may be *taught* to follow strains of music, but do they ever adopt it *themselves?* For persons our birds manifest strong preferences, but they do not seem to have a particularly well-developed memory, and are rather easily alarmed by any strange appearance. A few weeks since a strange lady, dressed in rather gay colors, undertook to touch one of them as he sat on my hand, when he was so alarmed that unable to fly, he dropped every tail feather, and stood transfixed for a moment till she withdrew.—*Mary E. Holmes.*

Masking of Crabs.—It is a matter of common observation that certain species of sea-coast crabs are during the greater portion of their existence covered with a superficial growth of foreign organisms, such as algæ, sponges, polyps and tunicates, which likewise cover inert bodies, and which were consequently supposed to find their way to the carapace of the animal in question as a result of pure accident. Dr. Graeffe, inspector of the Zoölogical station at Trieste, finds that this is not the case, however; that, instead of chance governing the location of these would-be parasites on the carapace of the crab, their presence there is due solely to the intelligent action of the animal supporting them, who, it would appear, intentionally places them in position with the feet, and for the sole effect of concealing itself from the gaze of its enemies. The selection for the covering, moreover, consists of such forms as most strictly partake in their coloring with the colors of the surrounding objects, and consequently of such as will be least liable to attract attention. Singularly enough, the species of crab thus disguising themselves are provided on the

back with a peculiar growth of hooked bristles, which tend to secure the objects placed there, and to retain them until they shall have become firmly united or rooted to the mass. The crab is seemingly aware of the fact that detached or lacerated portions of polyps and sponges are capable of further growth and development.—*American.*

ANTHROPOLOGY.[1]

AMERICAN HERO MYTHS.—Dr. Daniel G. Brinton is the author of a new work on American hero myths, published in Philadelphia by H. C. Watts & Co. Although professing to deal with the great heroes, Michabo, Ioskeha, Quetzalcoatl and Tezcatlipoca, Itzamina, Kukulcan, Viracocha, Votan, Gucumatz, Bochico, &c., the work has a wider scope and includes the whole question of comparative mythology as applied to American aborigines. Dr. Brinton is a pleasant, courteous writer, very rarely discharging a bomb-shell of innuendo or abuse.

The introductory chapter boldly states the author's views, the fundamental terms of the discussion are defined, and the groundwork on which myths are built up, clearly stated. "At the foundation of all myths lies the mental process of personification, favored by the American languages, through the grammatical distinction between animate and inanimate." *Paronymy, homonymy, polynomy, henotheism* and especially *otosis* have greatly fostered the process. The author's charming story concerning the Nickajak cave at Chattanooga, certainly would justify the appellation of the Nigger-Jack-theory to his method of explaining American hero myths.

The religions of America were tribal, with no aspirations to universality. Among them the most prominent character is that of a national hero, their mythical teacher and civilizer, often identified with the supreme deity and creator, who appeared among the ancestors of the tribe, gave them precious advice and gifts and disappeared, leaving hopes of his return. As a rule, each is a twin, or one of four brothers born at one birth, generally at the cost of the mother's life, who is a virgin, or at least not impregnated by man. The hero struggles with his brother, or one of his brothers, often involving the universe in repeated destructions.

In the words of Dr. Brinton: "All of these myths are transparent stories of a simple people to express in intelligible terms the daily struggle that is ever going on between day and night, between light and darkness, between storm and sunshine." This thought is brought out from page to page in a series of charming surprises which carries the reader's attention onward to the end of the book.

[1]Edited by Professor OTIS T. MASON, 1305 Q street, N. W., Washington, D. C.

Dr. Brinton thus summarily dismisses the Toltecs: "Who were these Toltecs? They have hovered about the dawn of American history long enough. It is time they were assigned to their proper place, and that is among the purely fabulous creations of the imagination. Toltec, Toltecatl, signifies an inhabitant of Tollan, the city of the Sun, in other words, a child of light. Without a metaphor, it meant at first one of the far-darting, bright-shining rays of the sun."

One of the most delightful of the many pleasing things in the volume, is the allusion to the ball-play of the stars, and to the stars as the spots on the great tiger skin of the sky, on p. 119.

To have an exalted appreciation of one's subject is requisite to its presentation with such vivacity as to awaken the earnest attention of the reader. The only danger is, that the writer will be carried off his feet by his own enthusiasm, and will think the thin air of speculation to be the solid ground of truth. For instance, Dr. Brinton strenuously insists that in all the hero myths the idea of a supreme creator and god of light, superior even to the sun itself, prevails. It may be so. Some will flatly deny. Others will say: "The facts are not so indisputably known as to justify a dogmatic assertion." It is apparent that the author has walked in pleasant converse with Sir George W. Cox and C. P. Tiele.

What is said concerning religion and morality is true to the extent that while religion relates to our conduct with reference to the unseen, and has its special ethical code; morality, as commonly understood, relates to our conduct with reference to our fellow-men, and has its special ethical code. Each, however, depends upon the other, and rules of conduct towards spiritual beings find their rationale in our duty to our fellow-men, as well as the contrary.

It gives us great pleasure to say in answer to what is averred on p. IX, that without doubt the Rev. J. Owen Dorsey, formerly an Episcopal missionary among the Dacotas, has collected more myths from the tribe with which he has associated than were known from all Indian tribes when Dr. Brinton wrote his Myths of the New World.

ATHROPOMETRY.—The following tables on human measurements are given in Hovelacque's "Les Races Humaines:"

	Height.			*Height.*	
Patagonians	1.78^{m}	5 ft. 10 in.	Roumanians	1.65^{m}	
Polynesians	1.76		Magyars	1.63	
Iroquois	1.73		Sicilians	1.61	
Guineans	1.72		Fins	1.61	
Caffres	1.71		Malays	1.59	
Scandinavians	1.71		Laps	1.53	
Scotch	1.71		Papuans	1.53	
Danes	1.68		Veddahs	1.53	
Arabs	1.67		Bushmen	1.40	4 ft. 7 in.
New Caledon	1.67				

Cranial capacity has long been a subject of inquiry for various purposes. M. Hovelacque quotes from Broca the following:

	Male.	*Female.*
Auvergnats	1.598 cu. dm.	1.445
Bas-Bretons	1.564	1.366
Basques Espagnols	1.574	1.356
Esquimaux	1.539	1 428
New Caledonians	1.460	1.330
Guinea Negroes	1.430	1.251
Australians	1.329	1.198

The cephalic index is the ratio of the width to the length of the skull, expressed decimally, and for convenience has received the following names:

Dolicocephaly	.75 and below.
Sub-dolicocephaly	.7501–.7777
Mesaticephaly	.7778–.80
Sub-brachycephaly	.8001–.8333
Brachycephaly	.8334 and upwards.

The races of men have been measured with a view to ascertaining their cephalic index. There are those who strenuously maintain that no evidence of race can be found in these measurements, notably, of late, Mikluko-Maclay, respecting the Papuans; on the other hand, the utmost confidence is reposed in them by others. M. Hovelacque furnishes the following table:

Australians	.71	Span. Basques	.78
Veddahs	.71	Bas Bretons	.81
Esquimaux	.71	Annamites	.82
Patagonians	.72	Ruthenes (Slav.)	.82
Hottentots	.72	Magyars	.82
Caffres	.72	So. Germans	.83
Guineans	.73	Tcheks (Slavs of Bohemia)	.83
Central Indians	.73	Croats	.84
Arabs	.74	Roumanians	.84
Egyptians	.76	Auvergnats	.84
Polynesians	.76	Savoyards	.85
Ainos	.77	Laps	.85
Tsiganes	.77		

The orbital index is another character of racial importance, it is the ratio of the height to the width of the orbital cavity. A few figures will show the variation in this regard:

Australians	.804	Auvergnats	.865
New Caledonians	.806	Indo-Chinese	.90
Hottentots	.836	Javanese	.91
Guineans	.84	Polynesians	.92
Croats	.845	Chinese	.938

The number of parts thus amenable to measurement are counted by the hundred, M. Topinard gives 105 in the "Mesures et Procédés craniometriques de Broca." The subject of asymmetry as related to crime and atavism has been brought painfully forward by the trial of Guiteau, the assassin.

Dialects of Bolivian Indians.—Dr. Edwin R. Heath, after a three years' residence in the department of Beni, in South Amer-

ica, contributes to the *Kansas City Review* (VI, 12) a paper of great value upon the Indians of Bolivia, accompanied with seven vocabularies. In the north-western part of Bolivia, along the Rivers Beni, Mamore and Yacuma, are various tribes of Indians, some civilized, others still savage, each having its distinct language, even though living side by side, having constant intercourse and intermarrying. The tribes mentioned in Dr. Heath's paper are arranged here in alphabetical order for ready reference:

Araunas.—A cannibal tribe on the banks of the Madre de Dios, a branch of the Purus, in N. W. Bolivia. Evidences of their cannibalism are given. They wear the hair long, go naked, and are greatly feared by the Pacavaras and Cavinas.

Cancaparangas.—A savage tribe on the Madeira river, above San Antonio falls, as far as the borders of Bolivia. Dangerous to travelers.

Canichanas.—A civilized tribe at San Pedro, on the Mamore, a tributary of the Madeira. They resemble the Mobinas in stature but are lean and bony. Vocabulary in the *Kansas City Review.*

Cavinas.—A mission on the Madidi river, just above its junction with the Beni in Bolivia. Reduced to seventy souls. Speak the Tacana language.

Cayuabas or Cayowas.—In and around Exaltacion, on the Mamore river. Well formed, average height 5½ ft. Vocabulary in *Kansas City Review.*

Chacobos.—On the west side of the Mamore, from Exaltacion to mouth of the Beni. Once in the Cayuaba mission but now returned to savagery.

Houbarayos.—A savage tribe on the east side of the Mamore, from Exaltacion to the mouth of the Guapore. They are a terror to all who ascend the river.

Maropas.—On the east side of the Beni river, twelve miles from the river at the little town of Reyes. Related to the Maropas. Vocabulary in *Kansas City Review.*

Mobimas.—At Santa Ana, on the Yacuna river, Bolivia, twenty-nine miles south of Exaltacion. Vocabulary in *Kansas City Rev.*

Mosetenas.—At the missions of Muchanes, Santa Ana, Covendo, at the head waters of the Beni river. They are partially civilized, spin and weave, practice couvade. Customs and vocabulary in *Kansas City Rev.*

Pacavaras.—A small tribe on the Beni river, between 11° and 12° south, only twenty souls, almost white, well formed, women handsome, features Caucasoid. Customs and vocabulary in *Kansas City Rev.*

Tacanas.—Divided into civilized and uncivilized; the former reside at the village of Tumupasa, lat. 14° S., twenty miles west of Beni river; the latter at Ysiamas, fifteen miles north-west of Tumupasa. Vocabulary in *Kansas City Rev.*

Trinitarias.—Reside in Trinidad, Bolivia.

RACE COLOR AND NATURAL SELECTION.—The fact that Mr. Darwin rejected natural selection as a factor in the production of the difference of color in the different races of men,[1] naturally prompts a spirit of deference in offering the following views, notwithstanding the well-known fact that he courted intelligent criticism of his conclusions.

That color by its harmony with general or special surroundings, in many cases not only assists animals in evading discovery and destruction, but enables the Carnivora to secure their prey more readily, is undisputed; yet sexual selection seems to be regarded by Darwin as the principal if not sole cause of the difference of race color in man.

Regarding a problem so involved, comprehending as it doubtless does the joint operation of several factors, possibly including some that are unknown, it would be rash to do more than suggest the probable.

When we reflect that there is good reason to believe that Africa and the Asiatic isles were the birth-place of the human race, and that it inherited from an ancestral form the dusky hue of the old world primates, and then call to mind the luxuriant foliage of the tropics that produces a deep gloom even at noonday, and then consider the advantages that the dark hue of the skin would, under such circumstances and with the body in a nude state, give to its possessor, not only in the successful pursuit of the chase and evasion of the Carnivora, but in the savage contests so common among primitive and uncivilized peoples; may it not fairly be inferred that natural selection played, and is still playing, a prominent part in determining race color.

It may also be noted that the hue of the North American Indian is well adapted to concealment among his natural surroundings, harmonizing to a great extent with the dried grass of the prairies, and in many cases with the ground itself, while it is particularly advantageous among the autumnal foliage, when in quest of the winter supply of game so essential to his survival, which even in unwooded districts is usually found in the vicinity of some stunted growth that may afford a cover to its retreat.

In fact it may be reasonably conjectured, considering the variety and variability of his environment, that the color of his skin is the best adapted to his success in the savage state.

As regards the evolution of the paler races, when we consider that supremacy is justly claimed by the palest race, the one most remote from the black in all respects, we may fairly conclude that sexual selection is one cause of the divergence from the original black, natural selection having long been rendered inoperative in this respect by changed conditions.—*Wm. B. Cooper.*

[1] "Descent of Man," Part I, Chap. VII.

SCIENTIFIC NEWS.

— The Appalachian Mountain Club has issued its Register for 1883, containing its by-laws, list of members, etc. A fresh number of its journal, *Appalachia*, was issued in April. Among the leading articles are Professor E. C. Pickerings's on mountain observations, A. E. Scott's on the Twin Mountain range, and Mr. W. O. Crosby's on the mountains of Eastern Cuba, in which he claims that Cuba has, in Post-tertiary times, been an area of extensive elevation, the reefs fringing its mountains to a height of nearly 2000 feet affording indisputable evidence. But he questions whether these reefs were formed while the land was actually rising. The reefs in fact are witnesses both for elevation and subsidence, "testifying with nearly equal distinctness to both elevation and subsidence." The coast of Cuba is said not to be probably rising now, at least not at all points. Hence Mr. Crosby does not agree with Mr. A. Agassiz, who claims that the West Indian reefs, at least that of Alcaran, were formed during the elevation of the sea bottom, but accepts Darwin's theory as an adequate explanation of the elevated reefs of the Greater Antilles; and he claims that the upheaval of this portion of the earth's crust has been interrupted by periods of profound subsidence, during which the reefs were formed. "The subsidence of 2000 feet, of which El Yunqne is a monument, must have reduced the Greater Antilles to a few lines of small but high and rugged islands; and, as Mr. Bland has shown, fully accounts for the absence, in these immense tracts, of all large land animals, although they were abundant here in Pliocene and earlier times."

— An interesting lecture, by M. A. Milne-Edwards, on the deep-sea researches carried on during the recent cruises of *Le Travailleur*, appears in the *Annals de Chimie et de Physique*. Among other things, the author says, they often came across the substance, at one time thought so important, called Bathybius, and he verified the conclusion already come to, that it must be taken down from its high pedestal. Bathybius is merely a mass of slimy matter, which the sponges and many zoophytes yield when their tissues are crushed by too rough contact with the dredging apparatus. While animals are very numerous in the deepest regions, plants are wholly absent; those green, red and violet algæ, so common near coasts, would be unable to live in the darkness, and they disappear below about 250 meters (say 830 ft.). Whence do these deep-sea animals obtain their food? Plants alone can work up from the gases of the air and non-living substances, the organic matters which afterwards serve for food of plant-eating animals, and, by their means, for that of flesh-eating species. "Therefore the food prepared at the surface, under the influence of the sun's rays, must gradually fall, like a kind of manna, into the submarine wastes where no plant can live."—*English Mechanic.*

— The question whether ostriches will breed in this State seems settled by what has occurred at Woodward's Gardens within the last few days. One of the female birds at that resort has commenced laying eggs and bids fair to continue in the work for some time. The first was laid on Tuesday and the second yesterday. One of them weighs three and a-half pounds, is four and a-half inches in lateral diameter and seven inches in longitudinal diameter. The ostrich lays every alternate day until she has ninety[1] eggs collected. Those at Woodward's Gardens are now on exhibition, as well as the baby camel, born on February 24th.

Those who have examined into ostrich farming are so confident of its success that a corporation has been formed for that purpose, with a capital stock of $30,000, all of it taken, called the California Ostrich Farming Company. A tract of 640 acres has also been secured on the old Abel Stearns ranch, near Anaheim, in Los Angeles county, which will be under the superintendence of Dr. C. J. Sketchley, formerly of Cape Town and an experienced ostrich farmer.—*San Francisco Chronicle, March 2, 1883.*

— In a recent lecture delivered at Leeds, says the English *Mechanic*, the Rev. W. H. Dallinger, F.R.S., spoke on the bearing of microscopical research on the origin of disease, and in the course of his remarks said the question might be asked, How was it when they were everywhere in contact with putrefactive germs, that they were not all diseased, and always diseased. The question was a pertinent one, and the answer, which had only been reached by modern inquiry, was a very definite one: that there was a total difference between what he might call the form of an organism and the function of an organism. He showed a group of putrefactive organisms, and said that if they took two of these organisms and looked at them, what would strike them was that the two forms were actually alike, but the one might be inserted into the blood of a human patient and be perfectly harmless; whereas the other, if inserted into the blood of a human patient, would cause death; so that the function was absolutely unlike.

— The Coast and Geodetic Survey steamer *Blake* returned to this port February 14, from a winter cruise for deep-sea exploration between the Bermudas and the Bahamas. On the 19th of January, in latitude 19° 41′ N., longitude 66° 24′ W., about 105 miles north-west of St. Thomas, there was found the greatest depth ever measured in the Atlantic, or 4561 fathoms. The place was about eighty miles south-west of the place where the *Challenger* made her deepest sounding, of 3862 fathoms. It was inside a basin—that is, many hundred fathoms down it was inclosed by a ridge. The temperature of the water at this great

[1] "Out of the four nests which I saw, three contained 22 eggs each, and the fourth 27." Darwin's Zoology of the Beagle. The number 90 must be an exaggeration.—Eds.

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Nov. 3.—Mr. Lesley exhibited some of the recent publications of the Second Geological Survey of Pennsylvania, and showed how near completion it now is.

Dec. 1.—Mr. Lesley made some remarks on the Egyptian character of certain Hebrew names. The *user*, or jackal-headed staff, was in use in royal names from the 4th to the 19th dynasty, and the Hebrew name *Is'ral*, corresponds with the hieroglyphic *Usr'ra*. *Esau* is the Edomite *Shasu*.

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Sept. 15.—Professor Cope exhibited and described some remarkable new fossil forms from the Permian rocks of Texas, and communicated a " Third Contribution to the History of the Vertebrata of the Permian formation in Texas."

Oct. 6.—Professor Lewis read a paper on the Terminal Moraine in Pennsylvania; Mr. Chase communicated a sixth series of Photodynamic notes; Professor Cope described *Meniscöessus conquistus*, the first mammalian species discovered in the Cretaceous.

Oct. 20.—Dr. H. C. Wood offered for publication in the Transactions a memoir entitled " On the nature of Diphtheria, a clinical and experimental research, by Drs. H. C. Wood and H. F. Formad;" Commodore E. Y. McCauley offered for publication in the Transactions a Dictionary of the Egyptian language; Professor I. C. White's communication on the " Geology of the Cheat river, West Virginia," was read; Professor Claypole's notes on the " Commingling of fossil forms," " The discovery of *Holoptychius americanus* low in the Chemung, at Leroy, Bradford Co., Pa," and on a mistake in the Geological map of Bradford county, were read; Mr. Lesley described " Some recent observations of the amount of ice erosion along the crest of the Kittatinny mountain," by Professor H. C. Lewis; Professor Cope communicated a catalogue of fifty-eight species entitled " Synopsis of the Vertebrata of the Puerco Eocene epoch," and a paper " On the systematic relations of the Carnivora."

Nov. 3.—Mr. Lesley exhibited some of the recent publications of the Second Geological Survey of Pennsylvania, and showed how near completion it now is.

Dec. 1.—Mr. Lesley made some remarks on the Egyptian character of certain Hebrew names. The *user*, or jackal-headed staff, was in use in royal names from the 4th to the 19th dynasty, and the Hebrew name *Is'ral*, corresponds with the hieroglyphic *Usrra*. *Esau* is the Edomite *Shasu*.

Jan. 5.—Professor Cope communicated a paper entitled " First Addition to the Fauna of the Puerco Eocene."

Jan. 19.—A committee of three were appointed to draw up a memorial to Congress urging the continuance of the Light-house

Board and of the Coast Survey under the direction and control of the United States Treasury Department.

Feb. 2.—Dr. Rothrock read a memoir on the microscopic differences in woods; and after discussion, with special reference to the occurrence of abnormal rings in the timber, Mr. Price remarked that Dr. Rothrock's important practical discovery was the direct result of the practical use to which the American Philosophical Society had put its portion of the Michaux legacy; Dr. Frazer presented a paper entitled "Some comparative tables showing the distribution of Ferns in the United States, by G. E. Davenport.

Feb. 16.—Professor H. C. Lewis introduced a discussion upon the thickness and movement of the Continental glacier.

March 2.—Mr. H. Hale read a paper on the Tutelo Indians and their language; Dr. Frazer described some useful improvements in the aneroid barometer, suggested by him, and exhibited two instruments so improved, by Hicks, of London; Professor Cope described as preposterous certain explanations of the extinction of fossil mammalia in the West by cold or by drought.

March 16.—Dr. Brinton read a paper by Professor T. F. Crane, of Cornell University, entitled "On Mediæval Books and Stories;" Professor Cope communicated a paper entitled "Fourth Contribution to the History of the Permian Formation of Texas."

Biological Society of Washington—April 13.—Communications were read by Professor L. F. Ward, on the Hybrid oaks of the District of Columbia; by Mr. B. F. Johnson, entitled Observations on the climbing of snakes; Professor C. V. Riley made remarks on the bag-worm *(Thyridopteryx ephemeræformis;)* Mr. F. W. True on the tape-worm and other parasites in the eggs of the domestic fowl; Dr. Thomas Taylor on the living parasitic mites in the lungs, cavities and tissue of domestic fowl, and Mr. N. P. Scudder on the muskrat (*Fiber zibethicus*) in captivity.

New York Academy of Sciences, April 30.—The following papers were read:—On the decay of building stones, part II, with illustrations from the old cemeteries of New Utrecht, Flatbush, etc., by Dr. Alexis A. Julien; On the disintegrated sandstone at New Durham, N. J., by Mr. Nelson H. Darton.

Boston Society of Natural History, March 7.—Professor G. Fred. Wright read a paper on the glacial phenomena of Ohio, and Mr. S. Garman presented a few notes on the fossil horses. April 18.—Mr. William M. Davis discussed the connection of gorges and waterfalls with glacial drift. May 2.—At the annual meeting the curator, secretary and treasurer presented their annual reports on the condition and doings of the society. The officers for 1882–3 were elected. The rest of the evening was given to an account of the altar-mounds and sacrificial rites of the mound-builders of the Ohio valley, by Mr. F. W. Putnam.

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